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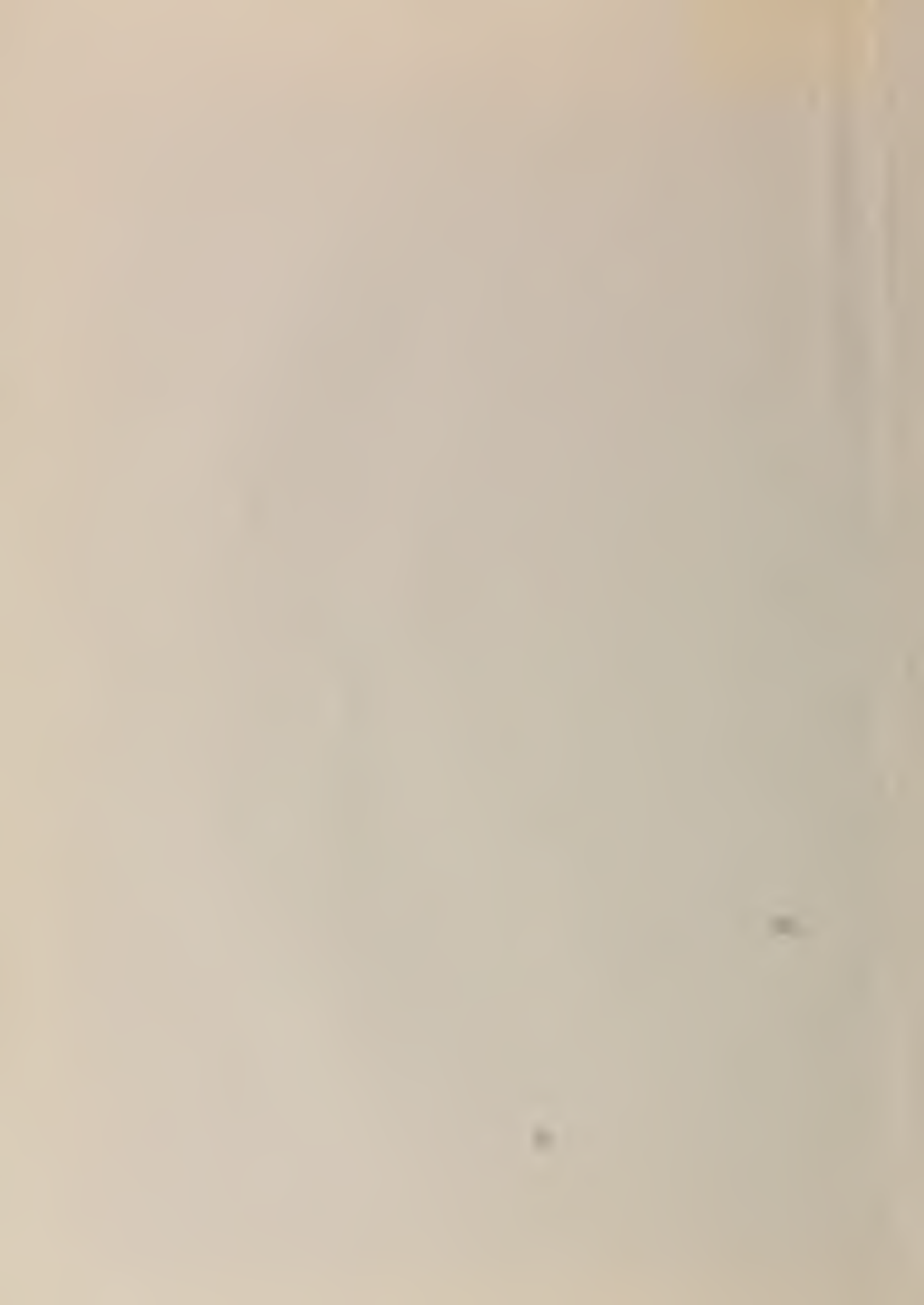
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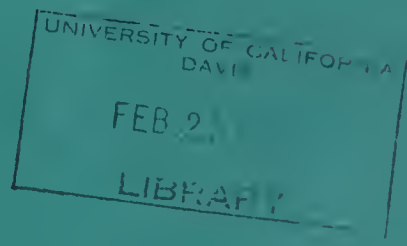
Department of Water Resources

RECREATION

APPENDIX to BULLETIN No. 76

DELTA WATER FACILITIES

Preliminary Edition



AUGUST 1962

EDMUND G. BROWN
Governor
State of California

WILLIAM E. WARNE
Administrator
The Resources Agency of California
and Director
Department of Water Resources



State of California
THE RESOURCES AGENCY OF CALIFORNIA
Department of Water Resources

RECREATION
APPENDIX to BULLETIN No. 76
DELTA WATER FACILITIES

STATEMENT OF CLARIFICATION

This preliminary edition presents a comparison of alternative solutions to the Delta problems. This bulletin shows that the Single Purpose Delta Water Project is the essential minimum project for successful operation of the State Water Facilities. This bulletin also presents, for local consideration, optional modifications of the Single Purpose Delta Water Project which would provide additional local benefits.

Preliminary Edition

The evaluation of project accomplishments, benefit-cost ratios, and costs of project services, are intended only to indicate the relative merits of these solutions and should not be considered in terms of absolute values. Benefits related to recreation are evaluated for comparative purposes. Detailed recreation studies, presently in progress, will indicate specific recreation benefits.

Subsequent to local review and public hearings on this preliminary edition, a final edition will be prepared setting forth an adopted plan. The adopted plan will include, in addition to the essential minimum facilities, those justifiable optional modifications requested by local entities.

AUGUST 1962

EDMUND G. BROWN
Governor
State of California

WILLIAM E. WARNE
Administrator
The Resources Agency of California
and Director
Department of Water Resources

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FOREWORD

This appendix to Bulletin No. 76, "Delta Water Facilities," presents the data and analyses basic to the studies supporting the conclusions appearing in Bulletin No. 76. The data and analyses presented in this appendix were collected and analyzed prior to the publication of Bulletin No. 76 and were considered as they relate to general recreational planning concepts. This appendix, therefore, is not to be considered a detailed blueprint for future recreational development.

Bulletin No. 76 is a preliminary report designed to assist local agencies and individuals in evaluating ways in which Delta problems can be solved within the framework of a Delta water project. Therefore, all conclusions presented in this appendix should also be considered preliminary.

Since the publication of Bulletin No. 76, the Department of Water Resources has initiated a more comprehensive recreational study in the Delta. In addition, the department is financing a Delta Fish and Wildlife Protection Study which is being conducted by the state Department of Fish and Game. Both of these studies are designed to augment past studies.

Following local review and public hearings on Bulletin No. 76, a final report will be issued which will incorporate local suggestions and such newer technical information as might develop from continuing studies.

CHAPTER I. INTRODUCTION

The Sacramento-San Joaquin Delta is located within two hours driving time from the greater San Francisco Bay area and is in the backyard of the growing metropolitan centers of Sacramento, Stockton, and the Pittsburg-Antioch area. As yet it has not been characterized by the suburban sprawl so typical of many areas of our State. The cities of Antioch and Stockton are growing both industrially and residentially, but as yet do not encroach upon the Delta lowlands. One of the Delta's greatest attractions to the recreationist is the chance to enjoy its great expanse of waterways.

With the growing significance of recreation, the Delta has developed into one of California's major recreation areas. In 1960 nearly 3,000,000 recreation-days were enjoyed in this boating wonderland.

The Delta has two distinct and important features which draw visitors from all areas of California and the nation. One of these is the striped bass fishery and the other is the extensive labyrinth of interconnected navigable waterways. The Delta provides one of the largest bodies of protected cruising waters in the western United States and a temperate climate permits year-round usage.

Authorization

The studies presented in this report were conducted pursuant to the Abshire-Kelly Salinity Control Barrier Acts of 1955 and 1957,

under the general obligation to study all aspects of water supply and utilization in the Delta. Specific language pertaining to the need for recreational development in the Delta was contained in the Abshire-Kelly Act of 1959, codified as Part 4.5, Chapter I, 12201 of the California Water Code. This section states that:

"The Legislature finds that the maintenance of an adequate water supply in the Delta sufficient to maintain and expand...recreational development in the Delta area ...is necessary to the peace, health, safety and welfare of the people of the State...."

Purpose

The purpose of this appendix is to assist other state and local agencies charged with recreational planning to formulate a master plan for Delta recreational facilities. Data is presented on present use of and demand for recreational facilities in the Delta with projections of future use and demand. Each of the alternative Delta water projects presented in Bulletin No. 76 will have a marked influence on the recreational potential of the Delta. The influence of these alternative water projects is discussed in this report.

Area of Investigation

The portion of the Delta with which this study was concerned was limited to the area which will be directly affected by construction of any one of the Delta water facilities, and the portion generally used by recreationists. These limits are shown on Plate 1, "Area of Investigation."

Conduct of Study

The Department of Water Resources contracted with Parsons, Brinckerhoff, Hall, and Macdonald, Engineers, to investigate and report upon recreation in the Delta area. Their report, entitled, "Sacramento-San Joaquin Delta, Master Plan for Recreation" was published in 1958. This report includes resort information, ferry and bridge tender data, a questionnaire survey, population studies, aerial boat counts in 1957 and 1958, and summaries of conferences with state, county, and municipal organizations.

To supplement and update the 1958 report, data were gathered in the spring and summer of 1960. This included extensive information from resorts concerning present use and a comprehensive traffic-questionnaire survey. Current population projections were also made. Liaison was maintained with governmental agencies engaged in related studies.

CHAPTER II. PRESENT RECREATION USE

This chapter contains data pertinent to present recreation in the Delta. Units of measurement of recreational activities, types of activities, residences of recreationists, areas of intensive use, and the conflict between various recreational interests, are discussed.

Recreation in the Delta may be grouped into two categories, water-borne and shore-based. Water-borne recreation includes fishing, cruising, water skiing, and sailing. Shore-based recreation includes fishing, picnicking, swimming, camping, and hunting. Fishing leads all other recreation activities, accounting for about 66 percent of the recreational activity in the Delta. The operation of pleasure boats accounts for about 21 percent of the recreational activity and the remaining 13 percent can be divided between the other activities listed above.

Interviews

Available published information was supplemented by interviews with resort owners, boat operators, and Delta residents. Detailed information on the number of boat rentals, frequency of boat launchings, size of rental boat fleets, type and number of berths available, and the weekly movements of boats using berthing facilities were gathered during these interviews. General information concerning recreational use, its changing pattern, and probable future trends was also obtained.

Traffic Survey

One objective of this investigation was to find the annual sum of all recreation activities within the Delta, measured in recreation-days.

Since direct measurement was not possible a questionnaire was sent to a random group of Delta recreationists. In order to provide a group of names and addresses, a traffic survey was made on Memorial Day, 1960. Memorial Day (May 30) traditionally opens the summer recreation period from June through August. In 1960 the day fell on Monday, the last day of a three-day weekend.

Personnel were located at 11 check points within the Delta where they recorded automobile license plate numbers and time, to the nearest quarter hour. This survey continued from one-half hour before sunrise to an hour before sunset. These locations are shown on Plate 2, "Recreation Survey Check Stations." At three of the check points only "in" traffic was recorded. No locations were picked where it was felt that the recreation traffic would predominate and other types of traffic would be at a minimum. License plate numbers of parked cars were recorded at about two-hour intervals. The areas where this was done are also shown on Plate 2. The combination of continuous check points and periodic checks of parking areas assured almost complete coverage of the Delta recreational area.

To eliminate duplication of license plate numbers the inbound and outbound records were compared, except for the three stations at which inbound traffic only was recorded. It was assumed that any vehicle remaining in the Delta less than two hours would not be considered to be carrying recreationists. After elimination of the through traffic, the sample comprised 5,800 license numbers of private vehicles.

Names and addresses of 50 percent of the registered owners of vehicles which had remained in the Delta in excess of 2 hours were

obtained from the Department of Motor Vehicles. Questionnaires were sent to these owners. The questionnaire, map, and letter of transmittal sent to these vehicle owners are shown on Plate 3, "Recreation Survey Questionnaire." More than 21 percent of the questionnaires were returned. Replies indicated that only 6 percent of the 5,800 vehicles were utilized for purposes other than recreation. The information obtained from the replies form a large part of the basic information upon which the patterns of present annual use of the Delta recreational area are predicted.

The questionnaire provided information on the residence of the recreationists, the average number in each group, the number and seasonal distribution of the days spent in water skiing, bank fishing, boat fishing, and pleasure cruising. The survey also disclosed the portions of the Delta used for various recreational activities and competing areas of recreation frequented by the recreationist. Comments were requested and the numerous replies clearly indicated that most recreationists have carefully considered recreational needs in the Delta.

Existing Facilities

As of the date of this study 123 facilities provided a wide variety of services to Delta recreationists. Prior to the recent boom in boating most of these centered around the berthing and renting of fishing boats. However, during recent years, with the increase in individually owned boats, there has been a change in type of service sought by the recreationist. Increased revenues have spurred the development of modern marinas, better launching facilities, fueling docks, dining establishments, and overnight accommodations. Many of the resort owners are constructing

covered berthing spaces rather than open docks. Since 1958 there has been a net gain of 11 facilities, bringing the total to 123. During the years 1958-1960 the number of public berths available for rent jumped from 4,038 to 4,985. This figure, coupled with 228 private berths, brought the total in 1960 to 5,213. During the same period resort owners trimmed their rental boat fleets from 1,681 to 1,503 boats.

Most of the facilities in the Delta are privately owned businesses which cater to the general public. There are four municipally owned launching ramps and two California state parks. There are 14 private clubs; 6 of them consist of a marina and clubhouse for the members; the other 8 are located on small, remote islands, generally accessible by boat only, on which members have constructed picnic areas and campgrounds.

All of the public use facilities have shoreline frontage and cater to the boating public. Most of them provide berth rentals for individually owned craft and some offer boats for rent. Launching facilities are available in most areas, although they are not evenly distributed and are in relatively short supply. Service docks for gas, oil, and minor repairs are fairly well dispersed. Nearly all resorts have visitor floats and lunch counters. Overnight facilities, especially cabins and motels, are not in sufficient supply to meet present peak demands. Two locations have oiled airstrips suitable for light planes. A few of the resorts have "planned" trailer parks, camping facilities, and picnic grounds, complete with sanitary facilities. However, most of the resorts have undeveloped lands upon which they allow the general public to picnic and in many instances to camp. These undeveloped areas are not included in the summary of accommodations shown in Table 1. A more detailed inventory

by individual facilities is presented in Table 2. Plate 4 "Delta Recreational Facilities," shows the location of the facilities identified by numbers in Table 2.

Table 1

SUMMARY OF DELTA RECREATION ACCOMMODATIONS

Facilities	:	Number
<u>Public Facilities</u>		
Resorts		101
Municipal ramps		4
Municipal Marinas		2
State parks		2
		<hr/>
Total		109
<u>Private Clubs</u>		14
		<hr/>
TOTAL FACILITIES		123

INVENTORY OF RECREATIONAL FACILITIES

DELTA AREA
1960

Inventory :		Facilities available										
number :		Boat	Rental:Launching	Visitor's: Fuel	Marine	Dining	Lunch	Picnic	Camp	Trailer:		
(For location: see Plate 3):		berths	boats:facilities:	float	dock	repair	room	counter:	area	ground:	park	Cabins
1	180	0	x	x	x	x	x	0	0	0	0	0
2	20	15	0	x	0	0	0	0	0	0	0	0
3	0	4	x	0	0	0	0	0	0	0	0	0
4	20	19	0	x	0	0	0	x	0	0	0	0
5	90	40	0	x	x	0	0	x	0	0	0	0
6	0	0	x	0	0	0	0	0	0	0	0	0
7*	66	0	x	x	0	0	0	x	0	0	0	0
8	56	20	x	x	0	0	0	0	0	0	0	0
9	140	0	0	x	x	0	0	x	0	0	0	0
10	200	0	0	x	x	0	0	x	0	0	0	0
11	200	21	0	x	x	0	0	0	0	0	0	0
12	137	0	x	x	0	0	0	0	0	0	0	0
13	400	0	x	x	x	0	0	x	x	0	0	0
14	50	18	x	x	0	0	0	x	0	x	x	0

x = Facilities available
 0 = No facilities available
 * = Private Club

INVENTORY OF RECREATIONAL FACILITIES DELTA AREA (Continued)

Inventory : number :		Facilities available											
(For location: see Plate 3):		Boat berths :	Rental: boats :	Launching: facilities:	Visitor's: float :	Fuel : dock :	Marine : repair :	Dining: room :	Lunch : counter:	Picnic : area :	Camp : ground:	Trailer: park :	Cabins
15	53	10	0	x	x	0	0	0	x	0	0	0	x
16	15	0	0	x	0	0	0	0	x	0	0	0	x
17	53	0	x	0	0	x	0	0	0	0	0	0	0
18	17	7	0	x	0	0	0	0	0	0	0	x	x
19	64	0	0	x	x	0	0	0	0	0	0	0	0
20	70	0	0	x	x	x	0	0	0	0	x	x	0
21	18	7	x	x	x	0	0	0	0	0	0	0	0
22	14	10	x	x	x	0	0	0	x	0	0	0	0
23	New acquisition for state park site--no facilities developed												
24	133	0	0	x	x	0	0	0	0	0	0	0	0
25	62	0	0	x	x	0	0	0	0	0	0	0	0
26*	15	0	0	x	0	0	0	0	0	0	0	0	0
27	28	0	x	x	x	0	0	0	x	0	0	0	0
28	60	42	x	x	x	0	0	0	x	x	x	x	x
29	18	8	0	x	0	0	0	0	0	0	0	0	0
30	60	92	x	x	x	0	0	0	x	x	x	x	x

INVENTORY OF RECREATIONAL FACILITIES DELTA AREA (Continued)

Inventory :		Facilities available											
number :		Boat : Rental: Launching : Visitor's: Fuel : Marine : Dining: Lunch : Picnic : Camp : Trailer:											
(For location: see Plate 3):		berths : boats: facilities: float : dock : repair : room : counter: area : ground: park : Cabins											
31	6	0	0	0	0	0	0	0	0	0	0	0	x
32	20	0	x	x	0	0	0	0	0	0	0	0	0
33	10	0	0	0	0	0	0	0	0	0	0	0	0
34	51	10	x	x	0	0	x	x	x	x	x	x	0
35	50	27	0	x	x	0	0	x	0	0	0	0	x
36	85	50	0	x	x	0	0	x	0	0	x	0	0
37	93	30	0	x	x	0	0	x	0	0	0	0	0
38	0	24	0	x	0	0	0	0	0	0	0	0	0
39	30	25	0	x	0	0	0	x	0	0	0	0	0
40	30	31	0	x	0	0	0	x	0	0	0	0	0
41	0	50	0	x	x	0	0	x	0	0	0	0	0
42	0	16	0	x	x	0	0	x	0	x	x	0	0
43	0	14	0	x	x	0	0	x	0	0	0	0	0
44	0	82	0	x	x	0	0	x	0	0	0	0	0
45	0	0	x	0	0	0	0	0	x	x	x	0	0
46	0	25	x	x	x	0	0	x	0	0	0	x	x
47	0	35	0	x	0	0	0	x	0	0	0	0	0

INVENTORY OF RECREATIONAL FACILITIES DELTA AREA (Continued)

Inventory : number :		Facilities available										
(For location: Boat : Rental: Launching : Visitor's: Fuel : Marine : Dining: Lunch : Picnic : Camp : Trailer: see Plate 3): berths : boats: facilities: float : dock : repair : room : counter: area : ground: park : Cabins												
48	96	0	x	x	x	0	0	0	0	0	0	0
49	0	0	x	0	0	0	0	0	0	0	0	0
50	0	19	0	0	0	0	0	0	0	0	0	0
51	10	33	0	x	x	0	0	x	0	0	0	x
52	60	12	x	x	x	0	0	x	x	x	x	x
53	19	23	x	x	x	0	0	x	0	0	0	x
54*	25	0	0	x	0	0	0	x	x	0	0	0
55	30	26	x	x	x	x	0	x	0	0	0	0
56	0	0	0	x	x	0	0	x	0	0	0	0
57	6	10	0	x	0	0	0	0	0	0	0	0
58	40	10	x	x	x	0	0	x	0	0	0	0
59	0	7	0	x	0	0	0	x	0	0	0	0
60	0	0	0	x	0	0	0	0	0	0	0	0
61	70	0	x	x	0	0	0	x	0	0	0	0
62	25	7	x	x	x	0	0	x	x	x	x	x
63	0	0	0	x	x	0	x	x	0	0	0	0
64	0	0	x	x	x	0	0	x	x	x	x	x
65	0	0	x	0	0	0	0	0	0	0	0	0

INVENTORY OF RECREATIONAL FACILITIES DELTA AREA (Continued)

Inventory : number :		Facilities available											
(For location: Boat : Rental: Launching : Visitor's: Fuel : Marine : Dining: Lunch : Picnic : Camp : Trailer: see Plate 3): berths : boats: facilities: float : dock : repair : room : counter: area : ground: park : Cabins													
66	93	15	x	x	x	0	0	x	x	x	x	0	x
67	29	36	x	x	x	0	0	x	x	0	0	0	x
68	40	0	0	x	x	x	0	x	x	0	0	0	0
69	0	0	0	0	0	0	0	0	0	x	0	x	x
70	30	0	0	x	x	x	0	0	x	0	0	0	0
71	0	0	x	x	x	0	0	0	x	x	x	x	0
72	140	40	x	x	x	x	0	0	x	0	0	0	0
73	109	40	x	x	x	0	0	0	x	x	x	0	x
74	0	13	0	x	x	0	0	0	x	0	0	0	x
75	0	10	x	x	0	0	0	0	x	0	0	0	0
76	40	0	0	x	0	0	0	x	x	0	0	0	x
77	32	37	0	x	x	0	0	0	x	0	x	0	0
78	40	15	0	x	0	0	0	0	x	0	0	0	0
79*	0	0	0	x	0	0	0	0	x	x	0	0	0
80	0	20	0	x	0	0	0	0	x	0	0	0	0
81	128	42	0	x	x	0	0	0	x	0	0	0	x

INVENTORY OF RECREATIONAL FACILITIES DELTA AREA (Continued)

Inventory : number :		Facilities available											
(For location: see Plate 3):		Boat : berths :	Rental: boats:	Launching: facilities:	Visitor's: float :	Fuel : dock :	Marine : repair :	Dining: room :	Lunch : counter:	Picnic : area :	Camp : ground:	Trailer: park :	Trailer: Cabins
82	265	30		X	X			0	0	X	0	0	0
83	95	25		X	X			0	0	X	0	0	0
84*	0	0		X	0	0	0	0	0	0	X	0	0
85	0	0		X	0	0	0	0	0	X	0	0	0
86	65	5	X	X	X			0	0	X	0	0	X
87*	0	0		X	0	0	0	0	0	0	X	0	0
88	12	0		X	X			0	X	X	0	0	X
89	112	16		X	X			0	0	X	0	0	X
90	52	0		X	X			0	0	0	0	0	0
91	0	0	X	0	0			0	0	0	0	0	0
92	200	0		X	X			0	0	X	0	0	0
93*	60	0		X	X			0	0	0	X	0	0
94	Aquatic park under development												
95*	0	0	X	X	0			0	0	0	0	0	0
96	65	0		X	X			0	0	0	0	0	0
97	0	0	X	0	0			0	0	0	0	0	0

INVENTORY OF RECREATION FACILITIES DELTA AREA (Continued)

Inventory : number :		Facilities available												
(For location: see Plate 3):		Boat berths :	Rental: boats :	Launching: facilities:	Visitor's: float :	Fuel dock :	Marine repair :	Dining: room :	Lunch: counter:	Picnic area :	Camp ground:	Trailer: park	Cabins	
98	73	0	0	0	X	X	0	0	0	0	0	0	0	0
99	48	0	X	X	X	0	0	0	0	0	0	0	0	0
100	65	0	0	0	X	X	0	0	0	0	0	0	0	0
101	50	4	0	0	X	X	X	0	0	0	0	0	0	0
102	15	6	0	0	X	0	0	0	X	0	0	0	0	0
103*	22	0	X	X	X	X	0	0	X	X	X	X	0	0
104	10	10	0	0	0	0	0	0	X	0	0	0	0	X
105	10	8	X	X	0	0	0	0	X	X	X	X	0	0
106	35	23	X	X	0	0	0	0	X	X	X	X	0	0
107	36	30	X	X	0	0	0	0	X	X	X	X	0	0
108*	5	0	0	0	X	0	0	0	X	X	X	0	0	0
109	30	14	0	0	0	X	0	0	X	0	0	0	0	0
110*	0	0	0	0	X	0	0	0	X	X	X	0	0	0
111	0	5	0	0	X	X	0	0	X	0	0	0	0	0
112*	35	0	X	X	0	0	0	0	0	0	0	0	0	0
113	0	18	X	X	X	X	0	0	0	0	0	0	0	0

INVENTORY OF RECREATION FACILITIES DELTA AREA (Continued)

Inventory : number :	Facilities available												
	Boat	Rental:Launching	Visitor's: Fuel	Marine	Dining: Lunch	Picnic	Camp	Trailer:	see Plate 3): berths	boats:facilities: float	dock	repair	room :counter: area :ground: park :Cabins
114	4	24	0	X	0	0	0	0	0	0	0	0	0
115	0	20	0	X	0	0	X	0	0	0	0	0	0
116	2	12	0	X	0	0	X	0	0	0	0	0	0
117	0	13	0	X	0	0	0	0	0	0	0	0	0
118	5	10	0	0	0	0	0	0	0	0	0	0	0
119	7	14	0	X	0	0	X	0	0	0	0	0	0
120	14	25	0	X	0	0	0	0	0	0	0	0	0
121	60	0	0	X	X	0	0	0	0	0	0	0	0
122	85	24	X	X	X	0	X	X	0	0	X	X	X
123	New development, facilities unknown												
Private	228	0	4	13	2	0	0	7	9	4	1	0	0
Public Use	4,985	1,503	41	91	68	15	4	67	17	19	17	25	25
TOTAL	5,213	1,503	45	104	70	15	4	74	26	23	18	25	25

Demand for Increased Recreational Facilities

Questionnaires returned indicated that most Delta recreationists feel that present facilities are inadequate. Table 3 shows the percentage of respondents, weighted for the percentage of respondents in each category, and the type of recreation expansion or intensification which they feel should have the highest priority. In many cases respondents indicated more than one item should have the "highest" priority. Many of the replies contained comments. These are discussed in the following, under the item to which they pertain.

Table 3

DEMAND FOR RECREATIONAL FACILITIES

Questionnaire respondents	Percent of respondents indicating facilities which would be most useful						
	:Launching : Camp- :Picnic:Access:Parking:						
	:Beaches:facilities:grounds:areas :roads : areas :Berths						
Owners of boats berthed in Delta	60	26	23	38	19	11	28
Owners of boats launched in Delta	74	80	58	43	36	26	9
Users of boats rented in Delta	50	32	37	26	28	9	7
Bank fishermen	37	22	44	47	53	44	9
	—	—	—	—	—	—	—
PERCENT OF TOTAL RESPONDENTS	62	47	41	38	30	19	15

Beaches

Beaches are very scarce in the Delta. As they are the focal point around which the day's activities are frequently centered they are

the most demanded item by all boaters. There are many sites within the Delta that could be developed as beaches. Sloping, tule-covered lands along some channels afford a fine potential for developing sandy beaches.

Launching Facilities

Launching facilities are in high demand by fishermen, water skiers, and pleasure boaters. The State Wildlife Conservation Board is presently constructing a number of ramps throughout the State under its Inland Fishing Access Program. One has been completed on the Sacramento River near Clarksburg. This board is also constructing launching facilities at Luis Park in Stockton, as part of the city's aquatic park development. Additional ramps will probably be constructed by various municipal and county authorities, as were the Antioch boat ramp and the City of Stockton's ramp at Buckley Cove. At the time of this study there were over a dozen resort owners who were planning to construct or expand launching facilities along their levee frontages.

Berthing Facilities

The demand for berthing spaces exceeds the supply during the summer months. Berths in the Delta are full 95 percent of the year. Many marinas have waiting lists, and newly constructed berths are generally rented months before their completion. There has been a rapid growth in the number of berths in recent years, particularly covered berths, and resort owners are just beginning to gain ground on the demand generated by the current boom in boating. While a very large portion of the boats moored in the Delta are smaller fishing boats and runabouts, owners of large power cruisers have the greatest need for berthing facilities. Some marinas cater exclusively to one type of user; others, to a combination

of types. Rental of covered berths is more costly, but still in heavy demand as the warm Delta climate requires extensive upkeep for boats unprotected from the sun.

Fueling Facilities

With 68 gas docks available to the general public within the Delta, and these fairly well dispersed, the large cruisers can generally find adequate fueling points. However, as outboard motors consume large quantities of gas, and generally have little fuel storage capacity, a problem exists for those who use such motors. A better distribution of fueling facilities would alleviate this problem.

Campgrounds and Overnight Accommodations

Campgrounds and overnight facilities are limited in the Delta. Some resorts have developed campgrounds and trailer parks, but accommodations often consist merely of vacant areas on the landward side of the levee where guests can pitch a tent or park a house trailer. Wooded cover is usually at a premium.

Usually in most recreational areas camping facilities have been left to public development. With the increase in numbers of privately owned boats, summer activity within the Delta area has greatly increased. Investment in recreational facilities consequently has received enormous incentive. Several resorts are expanding their camping facilities and planting trees for additional shaded areas. Some public development is taking place, as at Brannan Island State Park and Franks Tract State Park.

Motels and cabins are at a premium within the Delta and during the peak of the striper runs and the height of the summer advance reservations are usually required. First class motel units are being built

at a number of places and several more are contemplated. Although a large portion of their use is by residents of the Bay area, they have guests from all over the State, with the number of visitors from Southern California increasing yearly.

Picnic Areas

The need for picnic areas was frequently expressed in the questionnaire survey. These facilities are often developed in conjunction with campgrounds, as overnight and day-use areas are generally not separated. Tables, barbeque pits, water, and sanitary facilities are needed for both. Therefore, as public campgrounds are developed, picnic areas may be provided simultaneously. There is a demand for at least minimal picnic accommodations almost everywhere. Some resort owners have made informal provisions, in most cases merely a few benches and tables.

Road Access

Because of the many miles of interconnected channels, road access in the Delta is extremely limited. Reference to Plate 5, "Delta Roads and Travel Times," will show the extent of the network of improved roads. Though not shown on Plate 5, there are, in addition, many miles of dirt roads in the area. Most of these are primarily for farm use and levee maintenance, with a major portion of them closed to the public. For this reason, although nearly every island is surrounded by a levee road, a large portion of the Delta is inaccessible to the recreationist by automobile. This is especially true along the San Joaquin River and in the southern half of the Delta.

The roads open to the public are generally narrow and frequently in poor condition due to the high cost of road maintenance on peat soils. On summer weekends and during the height of the fishing season, wherever there is a concentration of activity, traffic moves slowly over these roads. This condition is aggravated by delays caused by slow-moving ferries which are still utilized at many channel crossings. Severe strain on the existing road network will be increased as recreational use of the Delta increases.

Parking

Lack of sufficient parking areas is a problem in the Delta. The increasing number of boats being towed into the Delta aggravates parking problems, as considerable space is required for maneuvering and parking. Available unimproved properties adjoining the levee on the land side are frequently utilized by resort owners for parking, as construction of paved parking areas and access ramps is most expensive. There is seldom room to provide any extensive parking along the levee road itself. Any development of launching sites should give serious consideration to adequate parking facilities.

Adequate parking for the bank fisherman is extremely limited. Possible fishing areas for shore fishermen are limited by the lack of road access and parking facilities.

Grocery Stores

These are in demand by both campers and those who cruise extensively and have sleeping and cooking accommodations aboard their

boats. Campers can purchase their groceries at nearby towns without too much inconvenience, but many desire a minimum stock of staples on the premises of their resort headquarters. In time, as profit incentives increase, resort owners will most likely cater to this need. Those who cruise the Delta waterways have indicated a need for grocery outlets located near most dockage facilities.

Remote Areas

With the rise of interest in pleasure boating and water skiing, there is a growing demand for the development of remote areas accessible only by water. In the past such developments have been undertaken primarily by private boat clubs. The increased demand has prompted county agencies to become interested in the matter. The purchase of Franks Tract by the Division of Beaches and Parks makes available an ideal location for future developments of this type.

Wilderness Protection

A frequent request on the returned questionnaire was one stressing the importance of protecting portions of the Delta from commercial encroachment and limiting the removal of levee vegetation. Many people would even like to see future development held to the present level. There is an almost universal appeal to preserve the solitude and enchantment of remote areas such as "the Meadows" at the confluence of Snodgrass Slough and the Mokelumne River. Any overall recreational planning in the Delta should minimize the destruction of natural vegetation along the waterways.

Magnitude and Seasonal Distribution of Recreational Use

Having determined the recreational facilities presently available in the Delta, and qualitative demand for increased facilities, it was necessary to correlate existing facilities with present use. Usage fluctuates from season to season, week to week, and day to day, depending upon a complex of factors such as weather, water and air temperatures, holidays, vacations, fishing and hunting seasons, the personal or family economic situation of recreationists, and many others.

Units of Measurement

The unit used to measure the magnitude of recreational use is the recreation-day. A recreation-day is defined as a portion or all of one day's activity spent by a single recreationist in the pursuit of any type of recreation. More than one recreational activity may be enjoyed by the recreationist in conjunction with his primary recreational use of the Delta area. For example, water skiers often engage in swimming, picnicking, or camping. In this study the magnitude of recreational use is determined for the primary activity of the recreationist, and such use is considered to include secondary recreation.

The concept of a boat-day is similarly defined as the use of one boat for a portion or all of one day used in the pursuit of any type of recreation. Knowing the size of the average boating party, it is a simple matter to convert boat-days to recreation-days. The average number of persons in a boating party was determined from the questionnaire survey and is tabulated by component and primary recreational activity in Table 4.

Table 4

SIZE OF BOATING PARTIES

Item	: Persons per party
<u>Berthed Boats</u>	
Fishing parties	3.26
Cruising and/or skiing parties	3.55
<u>Launched Boats</u>	
Fishing parties	4.82
Cruising and/or water skiing parties	5.14
<u>Rental Boat Parties</u>	3.14

Adjustment of Data Obtained From Questionnaires

Within the Delta area the recreation centered around boats is primarily spent in fishing, cruising, or water skiing. The sample of fishermen was not completely representative as it is known from data collected by the Department of Fish and Game that fishing is at its lowest point during the summer period.

Although the survey does not include a completely representative sample for establishing the seasonal pattern of fishing, it is believed that the replies did adequately determine the relative use for fishing, water skiing, and cruising for a summer period. The determination of the appropriate seasonal pattern for fishing activity was obtained by a subtractive process. The total recreational use for certain items was determined for each season of the year from available data. The total summer use was then apportioned to each primary activity in accordance with the relative use for fishing, cruising, and water skiing as determined by the questionnaire survey. Once the magnitude of water skiing and

cruising for the summer was determined, their seasonal distribution was obtained from the data in the returned questionnaires. Subtracting the magnitude of use for water skiing and cruising from the total use by recreationists in each season of the year gives the magnitude and seasonal distribution of fishing use. The magnitude and distribution of the fishing use determined by this subtractive method closely agrees with the known patterns of fishing activity in the Delta area.

Recreational Use by Component

After studying the data collected, the following eight components of recreational use were selected for detailed analyses: (1) boats berthed at Delta resorts and yacht clubs; (2) boats launched in the Delta; (3) boats rented in the Delta; (4) boats berthed at private docks in the Delta; (5) boats berthed in the Bay area; (6) boats berthed in the Sacramento area; (7) shore fishing; and (8) hunting. The method for determining recreational use for each component is described in the following pages.

Component 1. Boats Berthed at Delta Resorts and Yacht Clubs.

Data on public resorts and private clubs show that there are 5,213 berths available for rental in the Delta. It was determined that the berths are occupied 95 percent of the entire year. Data from the questionnaire survey indicated that boats classified under this component had an average annual use of 53.7 days. Multiplying 5,213 by 95 percent by 53.7 yields a total of 266,000 boat-days for this component. Utilizing the method described under adjustment of data obtained from questionnaires, the 266,000 boat-days were distributed between fishing, water skiing and water cruising by season. By using the size of boating party, as previously set forth, and summarizing, a total of 900,000 user-days was

found to be attributable to this component. Table 5 summarizes this component.

Table 5

SUMMARY OF USE, BOATS BERTHED AT DELTA RESORTS AND YACHT CLUBS
(Recreation-days)

Activity	: Spring : : (Mar-May)	: Summer : : (June-Aug)	: Fall : : (Sept-Nov)	: Winter : : (Dec-Feb)	: Total
Boat fishing	150,000	68,000	160,000	134,000	512,000
Cruising	75,000	121,000	71,000	46,000	313,000
Water Skiing	14,000	43,000	18,000	---	75,000
TOTAL	239,000	232,000	249,000	180,000	900,000

Component 2. Boats Launched in the Delta. The total seasonal use and distribution for this component were obtained from the data collected from resort owners. The total amounts to 113,000 boat-days. The same process utilized for Component 1 was utilized to obtain the seasonal distribution and magnitude of recreation-days for this component. This is summarized in Table 6.

Table 6

SUMMARY OF USE, BOATS LAUNCHED IN THE DELTA
(Recreation-days)

Activity	: Spring : : (Mar-May)	: Summer : : (June-Aug)	: Fall : : (Sept-Nov)	: Winter : : (Dec-Feb)	: Total
Boat fishing	115,500	34,000	128,000	62,500	340,000
Cruising	10,000	23,000	13,000	5,000	51,000
Water skiing	26,000	97,500	38,500	5,000	167,000
TOTAL	151,500	154,500	179,500	72,500	558,000

Component 3. Boats Rented in the Delta. The total seasonal use of rental boats was obtained from the owners of these boats. An annual use of approximately 88,000 boat-days was reported. In the 1958 report a detailed schedule of the seasonal distribution of rental boat usage is set forth; this schedule was utilized to distribute the total annual use. As virtually all rental boats are utilized for fishing, the average fishing party size was used to obtain the recreation-day for this component, as shown in Table 7.

Table 7

SUMMARY OF USE, BOATS RENTED IN THE DELTA
(Recreation-days)

Activity	: Spring : : (Mar-May)	: Summer : : (June-Aug)	: Fall : : (Sept-Nov)	: Winter : : (Dec-Feb)	: Total
Boat fishing	94,000	22,000	103,000	57,000	276,000
Cruising	---	---	---	---	---
Water skiing	---	---	---	---	---
TOTAL	94,000	22,000	103,000	57,000	276,000

Component 4. Boats Berthed at Private Docks in the Delta.

Included in this component were all the boats owned by local landowners and berthed at docks located on their own property. At a hearing conducted by the Assembly Interim Committee on the Sacramento and San Joaquin Delta, held in Martinez on June 17, 1960, information was presented indicating that 465 privately owned boats were docked at private docks on Bethel Island, Holland Tract, Palm Tract, Veale Tract, and Orwood Tract. Comparison of this area with the remainder of the Delta area, considering the relative

intensity of private docking facilities, indicated there are approximately 800 boats berthed in the entire Delta that can be classified within this component. From the questionnaires it was determined that for boats berthed at Delta resorts and yacht clubs, Component 1, an average annual use of 53.7 days was indicated. It appeared reasonable to assume that the incidence of use for boats included in Component 4 was somewhat higher, and 60 days was selected as the probable average annual use for this component. Inasmuch as the number of boats and the average annual use was estimated, the size of the boating party was assumed to be 3.5 persons per party rather than using the specific values shown in Table 4. Reference to Table 4 shows that the size of boating parties for different categories ranges from 3.14 to 5.14 persons per party. The computation of total recreation-days for this component was found by multiplying 800 boats times 60 days average annual use per boat times 3.5 persons per boating party, giving a total of 168,000 recreation-days. The proportion engaged in specific activities and the seasonal distribution of their use was assumed to be identical to that utilized for Component 1. Table 8, which follows, summarizes the data for Component 4.

Table 8

SUMMARY OF USE, BOATS BERTHED AT PRIVATE DOCKS IN THE DELTA
(Recreation-days)

Activity	: Spring : (Mar-May)	: Summer : (June-Aug)	: Fall : (Sept-Nov)	: Winter : (Dec-Feb)	: Total
Boat fishing	29,000	13,000	31,000	26,000	99,000
Cruising	13,000	22,000	13,000	8,000	56,000
Water skiing	2,500	7,500	3,000	---	13,000
TOTAL	44,500	42,500	47,000	34,000	168,000

Component 5. Boats Berthed in the Bay Area. From interviews with Delta resort owners and others familiar with the extent of recreational activity within the Delta area it was estimated that the recreational activity classified in this component would be equal to 15 percent of the boat-days found for Component 1. From these interviews it was determined that most of the boats in this component would be large power cruisers and sailboats used chiefly in cruising throughout the Delta area. To estimate recreation-days for this component a boating party of 4 persons was selected as appropriate. The estimates for total annual use and the seasonal distribution for this component appear in Table 9.

Table 9

SUMMARY OF USE, BOATS BERTHED IN THE BAY AREA
(Recreation-days)

Activity	: Spring : : (Mar-May) :	Summer : (June-Aug) :	Fall : (Sept-Nov) :	Winter : (Dec-Feb) :	Total
Boat fishing	6,000	1,000	7,000	2,000	16,000
Cruising	30,000	80,000	30,000	4,000	144,000
Water skiing	---	---	---	---	---
	-----	-----	-----	-----	-----
TOTAL	36,000	81,000	37,000	6,000	160,000

Component 6. Boats Berthed in the Sacramento Area. This component includes the boats berthed at resorts along the Sacramento River upstream from Courtland and extending to the Sacramento Weir. From data obtained by interviewing resort owners it was determined that there were 1,025 boats berthed in this area. These same resort owners provided

estimates of the extent and type of recreational use of these boats.

Table 10 summarizes the magnitude and seasonal distribution of these estimates.

Table 10

SUMMARY OF USE, BOATS BERTHED IN THE SACRAMENTO AREA
(Recreation-days)

Activity	: Spring : (Mar-May)	: Summer : (June-Aug)	: Fall : (Sept-Nov)	: Winter : (Dec-Feb)	: Total
Boat fishing	1,000	---	1,500	500	3,000
Cruising	6,000	18,000	6,000	1,000	31,000
Water skiing	---	---	---	---	---
TOTAL	7,000	18,000	7,500	1,500	34,000

Component 7. Shore Fishing. The estimated amount of shore fishing in the summer period was determined by applying the ratio of shore fishermen to boat fishermen developed from the replies to the questionnaire survey. The ratio between shore fishing and boat fishing for the other seasons was based upon surveys conducted in 1949 by Cope and Erkkelan of the U. S. Fish and Wildlife Service, the results of which were published in California Fish and Game Quarterly of January 1952. The resulting use and seasonal distribution are included in Table 11 below.

Table 11

SUMMARY OF USE, SHORE FISHING
(Recreation-days)

Activity	: Spring : (Mar-May)	: Summer : (June-Aug)	: Fall : (Sept-Nov)	: Winter : (Dec-Feb)	: Total
Shore fishing	186,000	56,000	203,000	133,000	578,000

In the light of information obtained from discussions with game wardens and members of the Sacramento and San Joaquin County River Patrols, and a resort owner with many years of residence in the Delta area, it is believed that these ratios between shore and boat fishermen are somewhat low for present conditions. It is recommended that additional surveys be made in the future to determine a more current estimate of the amount of shore fishing.

Component 8. Hunting. The magnitude and the seasonal distribution of hunting is tabulated in Table 12. The discussion of the development of these estimates is included in the discussion of recreational use by activity and season which appears later in the text. The Department of Fish and Game supplied most of the data utilized in developing the estimates for hunting.

Table 12

SUMMARY OF USE, HUNTING
(Recreation-days)

Activity :	Spring : (Mar-May)	Summer : (June-Aug)	Fall : (Sept-Nov)	Winter : (Dec-Feb)	Total
Hunting	---	---	77,000	29,000	106,000

Summary of Recreational Use, by Component. In Table 13, which follows, a summary of the total Delta recreational use, by component, is presented.

Table 13

PRESENT RECREATIONAL USE BY COMPONENT
(Recreation-days)

Com- ponent:	Definition	: Spring :(Mar-May):	: Summer :(June-Aug):	: Fall :(Sept-Nov):	: Winter :(Dec-Feb):	Total
1	Boats berthed at Delta resorts and yacht clubs	239,000	232,000	249,000	180,000	900,000
2	Boats launched in the Delta	151,500	154,500	179,500	72,500	558,000
3	Boats rented in the Delta	94,000	22,000	103,000	57,000	276,000
4	Boats berthed at private docks in the Delta	44,500	42,500	47,000	34,000	168,000
5	Boats berthed in the Bay area	36,000	81,000	37,000	6,000	160,000
6	Boats berthed in the Sacramento area	7,000	18,000	7,500	1,500	34,000
7	Shore fishing	186,000	56,000	203,000	133,000	578,000
8	Hunting	---	---	77,000	29,000	106,000
	TOTAL	758,000	606,000	903,000	513,000	2,780,000

Recreational Use by Activity and Season

Prior to the recent boom in pleasure boating the seasonal pattern of recreational use within the Delta was considerably different from that of today. The summer and winter periods had relatively little use. Presently, however, the current annual recreational use of the Delta, of 2,780,000 recreation-days, is distributed quite evenly throughout the year. Plate 6, "Seasonal Distribution of Present Recreational Activity in the

Delta Area" depicts the seasonal distribution of the four most popular recreational activities in the Delta -- fishing, cruising, water skiing, and hunting.

Fishing

Fishing is the predominate recreation activity within the Delta area. Surveys conducted by the Department of Fish and Game show that 10 percent of all the fishing in California occurs within the Delta area. The Delta fishery includes both anadromous and resident species of fish.

Anadromous fish are species which spend a portion of their life cycle in the ocean, but migrate into fresh or brackish water to spawn. The spawning migration, which brings these fish into the Delta area, provides the opportunity for the heavy fishing activity recorded. Striped bass, shad, salmon, and steelhead are represented in this fishery. Most of the fishing in the Delta is for striped bass; not as much effort is expended fishing for the other species. During the autumn migration the striped bass move into the brackish and fresh-water channels where they remain during the winter. With rising temperatures in the spring the fish utilize the Delta waterways to spawn. After spawning they eventually migrate downstream to continue the portion of their life cycle spent in salt water.

The peak periods for striped bass fishing occur during the spring and fall months. Bait fishing from anchored boats has proved to be the most productive method for taking striped bass. Bait fishing from the shore is usually less productive, but nevertheless attracts a large number of anglers each year. Currently the majority of the boat fishing is done from privately owned boats.

Catfish is by far the most important resident fish and attracts most of the summer fishermen. Over 50 percent of the annual catch consists of white catfish. The catfish fishery begins in February or March of each year and reaches a peak during the summer months and declines in December. Black bass constitute a lesser fishery and are taken throughout the Delta in the smaller, fresh-water sloughs. Bluegill and crappie are also taken but do not constitute an intensive fishery. Table 14 summarizes the annual fishing activity in the Delta.

Table 14

DISTRIBUTION OF ANNUAL FISHING ACTIVITY
(Recreation-days)

Boat Fishing	: Spring :(Mar-May):	: Summer :(June-Aug):	: Fall :(Sept-Nov):	: Winter :(Dec-Feb):	: Total
Boats berthed at Delta resorts and yacht clubs	150,000	68,000	160,000	134,000	512,000
Boats launched in Delta	115,500	34,000	128,000	62,500	340,000
Boats rented in Delta	94,000	22,000	103,000	57,000	276,000
Boats berthed at private docks in the Delta	29,000	13,000	31,000	26,000	99,000
Boats berthed in the Bay area	6,000	1,000	7,000	2,000	16,000
Boats berthed in the Sacramento area	1,000	---	1,500	500	3,000
Total Boat Fishing	395,500	138,000	430,500	282,000	1,246,000
Shore fishing	186,000	56,000	203,000	133,000	578,000
GRAND TOTAL FISHING	581,500	194,000	633,500	415,000	1,824,000

The figures shown for shore fishing were derived as explained in the preceding discussion of recreational use by components.

Cruising

Cruising is the second most important boating activity in the Delta, though far behind fishing. Almost every type of boat is utilized for cruising, ranging from large cruisers to small runabouts. Frequently cruising is in conjunction with other water sports, part of the day being spent in cruising and part in water skiing or fishing. While the range and speed of today's boats allow an extensive coverage of the waterways in a normal outing, the preferred pattern of activity usually includes a quiet anchorage at some secluded area.

The majority of the cruising in the Delta occurs during the extended summer season, which reaches its peak during July and August. Cruising continues through the winter, although during this season it is at its lowest point. Large cruisers, complete with sleeping, cooking, and sanitary facilities, can cruise the Delta channels even during inclement weather. The majority of cruising is done by people who berth their boats in the Delta, although a substantial portion is done from boats berthed in the Bay area. Table 15 summarizes cruising activity.

Water Skiing

Although a recent development in water sports, water skiing has already become immensely popular. Even though this sport requires a good deal of stamina and coordination, it is enjoyed today by thousands of people, young and old. The family group is a very typical part of the water skiing picture. Water skiing is largely a seasonal activity, being closely associated with comfortable summer air and water temperatures.

Table 15

DISTRIBUTION OF ANNUAL CRUISING ACTIVITY
(Recreation-days)

Cruising Activity	: Spring : :(Mar-May):	Summer : (June-Aug):	Fall : (Sept-Nov):	Winter : (Dec-Feb):	Total
Boats berthed at Delta resorts and yacht clubs	75,000	121,000	71,000	46,000	313,000
Boats launched in Delta	10,000	23,000	13,000	5,000	51,000
Boats rented in the Delta	---	---	---	---	---
Boats berthed at private docks in the Delta	13,000	22,000	13,000	8,000	56,000
Boats berthed in Bay area	30,000	80,000	30,000	4,000	144,000
Boats berthed in the Sacramento area	6,000	18,000	6,000	1,000	31,000
TOTAL CRUISING	134,000	264,000	133,000	64,000	595,000

Water skiing is tied directly to the current boom in boat sales and outboard motors. One of the basic needs of this sport is a boat capable of maintaining about 20 knots. Many boats with inboard motors are in use, but the outboard motor and the boat with molded fibreglass hull are the most popular combination for towing water skiers.

The availability of areas of suitable water surface is a prime consideration for water skiing. Good skiing areas should provide beaches, ample room to operate high speed boats, be relatively wind-free, and be free of barely submerged objects and floating debris.

Most of the water skiing is done from boats launched in the Delta. These high-powered boats consume vast quantities of fuel and cannot be far from a source of supply for very long. The water skiers

have a greater demand for beaches than any other recreational group, for usually they have no accommodations aboard their boats, nor room to carry the entire party comfortably at one time.

Nearly all the water skiing in the Delta is done from mid-spring to mid-fall with a sharp increase in the summer. Despite the fact that many skiers are beginning to use protective rubber suits, water skiing is still negligible during the winter season. Two-thirds of the skiers tow their own boats to the Delta and utilize the available launching facilities. The seasonal use by water skiers is tabulated in Table 16.

Table 16

DISTRIBUTION OF ANNUAL WATER SKIING ACTIVITY
(Recreation-days)

Water Skiing	: Spring : :(Mar-May):	Summer : (June-Aug):	Fall : (Sept-Nov):	Winter : (Dec-Feb):	Total
From boats berthed at Delta resorts and yacht clubs	14,000	43,000	18,000	---	75,000
From boats launched in the Delta	26,000	97,500	38,500	5,000	167,000
From boats rented in Delta	---	---	---	---	---
From boats berthed at private docks in the Delta	2,500	7,500	3,000	---	13,000
From boats berthed in the Bay area	---	---	---	---	---
From boats berthed in the Sacramento area	---	---	---	---	---
TOTAL WATER SKIING	42,500	148,000	59,500	5,000	255,000

Hunting

Waterfowl and pheasant are the most popular game hunted in the Delta. The waterfowl season generally runs from October to January. The pheasant season is usually during the latter half of November. Pheasant hunting is usually at a maximum during the first few days of the hunting season. In contrast, waterfowl hunting is comparatively steady throughout the season.

Waterfowl. There are 160 waterfowl shooting clubs known to exist within the study area. Members of these clubs shoot 2 or 3 days a week or about 35 days out of a 93-day season. Analysis of unpublished gun club data for the Delta show that an average of six people belong to a club and the same average number of persons, including guests, participate in a regular day's shoot. A shooting day in the Delta would involve about 960 shooters, or a seasonal use of 33,600 recreation-days.

Waterfowl shooting is not confined to private clubs. It is difficult to measure the hunting on private lands within the study area by the unattached hunter. State conservation officials give what they consider a conservative estimate of 20,000 hunter-days expended by the unattached waterfowl hunters in the study area during 1959. This figure was used in this report for 1960.

The total waterfowl hunting effort for the study area for 1960 is given as: (1) 33,600 recreation-days for hunting clubs; (2) 20,000 recreation-days for unattached hunters; for a total of 53,600 recreation-days.

Pheasant. Virtually all good pheasant hunting is found on private lands. The only exceptions are the state and federal waterfowl

management areas where pheasant hunting is allowed. Good pheasant populations are confined to areas where agricultural practices are conducive to providing pheasant habitat and food. Those public lands having pheasant populations are adjacent to private agricultural lands or they have certain agricultural practices carried on as part of game management programs.

The hunting effort on state supervised hunting cooperatives is a matter of record. It is considerably more difficult to ascertain hunting effort in other areas. Pheasant hunting cooperatives are on private lands which the Department of Fish and Game supervises during the hunting season. There were five such cooperatives during 1959 and 1960.

In 1954, nearly 190,000 acres under cooperative management were available to the sportsmen in the State, but there has been a steady decline in the amount of land available for this purpose. By 1959 only 96,000 acres remained in the cooperatives. Reasons for the decline are numerous. The most important factor is that landowners are becoming more and more aware of the possibilities of supplementing their income through the sale of hunting and trespass privileges to the growing number of private hunting clubs. As the number of acres under control of private hunting clubs has increased, there has been a corresponding decrease in the acreage available for cooperative hunting areas.

Hunting on cooperative areas during 1959 totaled approximately 21,000 user-days as shown in Table 17.

At present, state conservation officials are unable to give an exact figure of pheasant hunting in the areas outside the state-controlled cooperative hunting areas. A conservative estimate has been given as 21,000 recreation-days, the same as that of the cooperatives.

TABLE 17

COOPERATIVE PHEASANT HUNTING AREAS IN THE DELTA, 1959

Cooperative Area	: Acres	: Hunter-days
Sherman Island	8,428	5,036
Twitchell Island	5,879	3,759
Ryer Island	13,800	4,659
Tyler Island	7,036	3,503
Staten Island	9,200	3,836
TOTAL	44,343	20,793

Miscellaneous Hunting. From statewide hunting patterns it was surmised that dove, quail, and rabbit hunting comprised about 10,000 hunter-days annually, distributed equally over the span of hunting seasons.

Table 18 summarizes hunting in the Delta.

TABLE 18

DISTRIBUTION OF HUNTING IN THE DELTA DURING 1960

Type	: Fall : (Sept.-Nov.)	: Winter : (Dec.-Feb.)	: Total
Waterfowl			
Clubs	18,000	16,000	34,000
Unattached	12,000	8,000	20,000
Total	30,000	24,000	54,000
Pheasant			
State	21,000		21,000
Unattached	21,000		21,000
Total	42,000		42,000
Miscellaneous (Doves, quail, rabbits, etc.)	5,000	5,000	10,000
GRAND TOTAL	77,000	29,000	106,000

Other Activities

Sailing and swimming are popular sports but cannot be considered as primary activities in the Delta.

Sailing. Sailing comprises less than 2 percent of the boating in the Delta, therefore, it was included with cruising in this study. Nevertheless, it is an important aspect of the recreation picture.

Sailboats frequenting the Delta waters are of all sizes from small boats restricted to quieter waters to sailing yachts capable of transocean cruising. Most of the small boat sailing is concentrated in the San Joaquin River near Stockton. A limited amount of small boat sailing is done in sloughs throughout the Delta and near the towns of Rio Vista and Antioch. The draft of the sailboats requires them to utilize much deeper water than power cruisers of a similar size. This restricts large sailboats to the main channels and major sloughs.

Swimming. There are a limited number of beaches suitable for swimming in the Delta. Those few which exist are fairly small, and heavily utilized. Few of the resorts have beaches. Most of the swimming in the Delta is done from boats. Swimming is seldom a primary objective of people coming to the Delta, but if more beaches were available, it might become a primary activity. Table 19 shows the annual distribution of primary activities in percentages of annual use.

Residence of Recreationists using the Delta Area

While the Delta attracts visitors from the entire State and has some national attraction, over 90 percent of the recreationists are

TABLE 19

ANNUAL DISTRIBUTION OF PRIMARY ACTIVITIES
(Recreation-days)

	: : Spring : : (Mar-May):	:Percent: : of : : total :	:Summer : : (June-Aug):	:Percent: : of : : total :	:Fall : : (Sept-Nov):	:Percent: : of : : total :	:Winter : : (Dec-Feb):	:Percent: : of : : total :	Total
Primary Activity:									
Fishing	581,500	32	194,000	10	633,500	35	415,000	23	1,824,000
Cruising	134,000	22	264,000	44	133,000	22	64,000	12	595,000
Water skiing	42,500	17	148,000	58	59,500	23	5,000	2	255,000
Hunting	---	0	---	0	77,000	73	29,000	27	106,000
Total for all activities	758,000	27	606,000	22	903,000	32	513,000	19	2,780,000

residents of the eight surrounding counties. The residences of Delta recreationists were taken from the data obtained from the 1960 Memorial Day traffic survey. Table 20 sets forth the residential areas and the percentage of total annual use by residents of each area. Plate 7, "Areas of Origin, Delta Recreationists," shows the present and estimated future number of recreation-days expended in the Delta for the areas shown in Table 20.

Two factors play an important part in whether or not recreationists select the Delta area. One is the proximity of residence to the Delta area and the other is the availability of nearby alternative recreational areas. The residents of the North Bay area of Marin, Solano, and Napa Counties use the Delta area much less than residents of San Francisco and San Mateo Counties. The residents of the peninsula are more frequently visitors to the Delta, as alternative recreational sites are not so readily accessible. Residents of the North Bay area can choose Clear Lake, Monticello Reservoir, Lake Mendocino, the Napa River, the Russian River, Bodega Bay, or Tomales Bay as alternatives for recreational use. Recreationists from other parts of the State represent a small fraction of the overall use, partly because of distance and no doubt in part due to the availability of alternative recreational areas.

Although there is consistent weekday recreation use of the Delta, most of the use occurs during the weekends. Statistics from Brannan Island State Park and resort owners clearly show this pattern. The weekday recreationist is usually a resident of one of the nearby population centers. Residents of San Joaquin and Contra Costa Counties constitute almost half of the total users of the Delta area.

TABLE 20

RESIDENCES OF DELTA RECREATIONISTS

Area of residence	:	Percent of present annual recreational use
San Joaquin County	:	27.2
Contra Costa County	:	21.8
Alameda County	:	17.4
Sacramento County	:	10.7
San Francisco and San Mateo (peninsula)	:	6.5
Santa Clara County	:	5.9
Solano County	:	2.8
Subtotal	:	92.3
All other areas	:	7.7
TOTAL	:	100.0

The selection of Courtland as the northern boundary of the Delta recreation area excluded the intensive use of the Delta by residents of the Sacramento area, who use the Sacramento River for cruising, water skiing, and fishing.

The residents of the Pittsburg-Antioch area account for half of the entire use of the Delta by all residents of Contra Costa County. Over half of the recreational use of the Delta by Solano County residents comes from residents of the Rio Vista area.

Concentration of Recreational Use

Recreational use of the Delta for each of the primary activities varies from place to place as well as from time to time. However, each activity tends to concentrate in certain areas. Plate 8, "Present Concentrations of Boat Fishing in the Delta Area," Plate 9, "Present Concentrations of Cruising in the Delta Area," and Plate 10, "Present Concentrations of Water Skiing in the Delta Area," show the concentrations for use of fishing, cruising, and water skiing. The width of the channels are scaled to show the intensity of use in average annual recreation-days per mile of channel or slough. Areas of intensive use for brief periods of time are not indicated.

The distribution of use within the Delta area was based on the data obtained from the 1960 questionnaire survey. The distribution for water skiing was obtained from aerial boat counts made on 12 different days during 1958.

Fishing

The concentration of fishing is dependent upon two factors: (1) the presence of fish to be caught, and (2) ease in reaching points near the fish concentrations. Fishing is concentrated along the lower Sacramento and San Joaquin Rivers, and the channels and sloughs surrounding Franks Tract. The northern area of the Delta has a greater concentration of fishing activity than the more southerly areas. Concentrations result primarily from the pursuit of striped bass. Fishing on some of the more outlying sloughs would undoubtedly be increased if access to such areas was made easier.

Cruising

While nearly all Delta channels are open to shallow-draft vessels, even the larger cruisers can use hundreds of miles of channels. Cruising activity tends to concentrate on the San Joaquin River and adjacent sloughs. South of the San Joaquin River, where the channels become less accessible and facilities more scattered, there is a decrease in intensity of use. Extensive use is made of the channels around Bethel Island and Franks Tract, the lower portions of Old and Middle Rivers, and all the connecting sloughs. North of the San Joaquin the cruising is spread fairly evenly over the channels which converge on the "Meadows area" north of Walnut Grove. The "Meadows area" is a veritable wilderness accessible by boat only, and is the most popular anchorage in the Delta. Other favorite anchorage areas are at the head of Steamboat Slough, the sloughs around Lower Sherman Lake, Potato Slough, and among the many little islands that dot the main channel of the San Joaquin and Old Rivers.

At present, many large boats entering the Delta from the north by way of the Sacramento River reach the San Joaquin River by way of Threemile Slough. Smaller boats can traverse the cross-canal at Walnut Grove to the Mokelumne River during the summer season for more direct transit to the central Delta. In the winter season, however, the regulatory gates of the cross-canal are generally closed. When the cross-canal gates are closed Georgiana Slough is used by a great many boats.

Most boats entering the Delta from the Bay area enter via the San Joaquin River and disperse from there. Some, however, proceed up the Sacramento River, bound for the upper end of Steamboat Slough.

Water Skiing

Those who water ski seek locations of sufficient size, protected from heavy winds, free from obstructions, close to fueling and launching facilities, and if possible, close to beaches. Favored areas are the protected waters of Old and Middle Rivers, especially around Orwood Tract, the San Joaquin River from Stockton to Venice Island, the sloughs around Franks Tract, Snodgrass Slough, Potato Slough, Mayberry Slough, and Grant-Line Canal.

The southern portion of the Delta offers a fine potential for further development of water skiing. The waters are well protected, and there is less conflict with fishermen. However, lack of road access and lack of sufficient launching and fueling facilities keep the use of these areas relatively low.

Conflicts Associated with Recreational Interests

Recreational use can conflict with other uses of land and water and certain recreational activities compete with each other. Both of these cases occur within the Delta area.

One of the conflicts is that which occurs between the recreational user and the landowners within the Delta region. The shore fisherman desires to drive as close as possible to his fishing spot. Boat owners wish to launch their boats fairly close to the area selected for their activity. Some landowners, however, restrict the use of levee roads to recreationists during certain seasons, while others completely deny their use to recreationists. Such restrictions undoubtedly contribute to the

shortage of launching facilities and other services in certain areas of the Delta.

The conflict between fishermen, water skiers, and those who cruise the Delta waterways is growing. Fishermen, at times, interfere with the free movement of water skiers. At times fishing boats also impede the movement of those cruising the waterways, and make navigation by commercial boats extremely difficult.

High speed boats interfere with fishermen and sometimes endanger smaller boats by their wakes. Waves caused by high wakes can also do extensive damage to levee banks, docking facilities, and moored boats. High speed runabouts and cabin cruisers also interfere with the use of certain channel reaches by water skiers. Heavy boat traffic can cause severe problems to the water skier who must maintain a fairly high speed. At times, areas favored for anchorages become quite congested and boat movements become difficult.

Water skiers pose problems for both fishermen and for those cruising the Delta. High speeds close to anchored boats can create serious disturbances and wave-wash along the shore can be a nuisance to the bank fishermen.

A solution to the problem of conflicting interests among water-associated recreation activities would be waterway zoning. Wherever new lakes or reservoirs are being developed, and recreation planning is involved, some form of zoning is generally considered by the agencies responsible for administration and regulation of the recreational areas. Adoption of zoning regulations usually provides a maximum development of

the site and helps to offer more enjoyment to the recreationist. Zoning can be accomplished by any one of several methods or by a combination thereof. There are three basic types of zoning: (1) by activity, (2) by speed, and (3) by time.

Zoning by activity simply means setting aside certain areas for specific use such as fishing, water skiing, and swimming or anchorage. By comparing concentrations of recreational activities, as shown on Plates 8, 9, and 10, it appears that certain areas are now utilized primarily for one major type of recreational activity. Places such as these afford excellent opportunities for zoning by activity.

The second general type of zoning is by speed. This is a very flexible type of zoning and can accomplish many purposes. Speed is held generally to five miles an hour in and around docks and swimming beaches. Other areas have speed limits of ten to twenty miles-per-hour, which is suitable for all general forms of pleasure boating. High speed use could be restricted to areas where excessive speed will not cause damage or create a nuisance.

Zoning can also be done by time. Such times may be seasonal, daily, or hourly.

CHAPTER III. FUTURE DELTA RECREATION

Recreational use of an area is governed by the relative attractiveness or suitability of its environment for recreational utility as compared to alternative areas, and the psychological factors that motivate a need for recreation within the general public. The effect of the more significant elements in predicting future recreational use are discussed in the succeeding pages. The technique selected for estimates of future recreational use and the resulting recreational demand are presented in the concluding section of this chapter.

Population

It is estimated that 90 percent of the recreational use of the Delta is by residents of the eight surrounding counties. A projection of future recreational use is closely related to estimated future population of these counties. California's population growth has been and is growing very rapidly. Future predictions of growth indicate that the present state population of 15,830,000 persons will increase to 28,200,000 persons by 1980 and to 56,000,000 by the year 2020. In the eight-county area contiguous to the Delta, the present population is 4,035,000. It was estimated that this will increase to 6,860,000 by 1980 and to 13,300,000 by 2020. This population increase will undoubtedly provide a continuing increase in the number of Delta recreationists.

Age Distribution

Each type of recreation appeals primarily to those within a certain age group. Recreational activities in the Delta run the gamut, however, from semiactive bank fishing to very active water skiing. Although the percentage of young persons within the California population is rising, and is expected to continue to rise during the next 20 years, it is not expected that this age distribution shift will have an appreciable effect on the per capita rate of total recreational activity within the Delta. As individuals grow older their recreational interests will tend to change from active to semiactive to semisedentary activities but they might still seek their recreation within the Delta area.

Psychological Need for Outdoor Recreation

The pressure of today's urban living has created a great need for more outdoor recreation, with an attendant demand for the development of necessary facilities. As the pace of living has quickened, people have become more aware of the benefits to be derived from outdoor recreation and its place in a balanced and well-adjusted life.

Increased Leisure Time

Present trends indicate that a shorter work-week, a shorter work-day, and longer periods of paid vacations can reasonably be expected for a large portion of California's future population. A shorter work-day will allow recreationists to seek more frequent recreational activity. Longer weekends and extended vacations will provide opportunities to visit distant areas. The possibility of increased time for travelling to and

from a recreational area will make more areas available to the recreationist. The opportunity for nearby residents of the Delta to go further afield may be compensated for by those coming to the Delta from remote parts of the State and nation.

Facility of Access

The probable intensity of future recreational use of the Delta depends to some degree on the ease of reaching the Delta and the availability of suitable access roads within the Delta itself.

Current highway development plans are such that general access to the Delta region will progressively improve. Freeways and new routings will make the Delta, along with other parts of California, more readily available to the motoring public. Any access improvements within the Delta proper will simplify reaching areas which are now isolated.

Competitive Recreational Areas

Returns from the 1960 questionnaire show that the major areas competing with the Delta are nearby lakes and other recreational areas. Folsom, Nimbus, and Monticello Reservoirs provide considerable competition to the Delta area. Water sports and fishing are quite popular in each of these man-made lakes. Suisun and San Francisco Bays and the shoreline of the Pacific Ocean are also areas of recreational appeal. The Russian River, the Napa River, and Clear Lake are existing attractions which compete for recreationists from the surrounding area. Future recreation sites will probably be developed and expanded at all of these

areas, as well as at other locations. However, it is believed this will cause no significant change in the per capita rate of Delta recreation.

Estimated Recreational Demand

Future recreational demand was estimated using the assumption that the rate of participation by residents of the areas presently supplying the Delta recreationists would remain constant. The projected population of an area, at some future date, multiplied by the per capita rate of recreational use per year, gives the future annual recreation-days or recreational demand. Recreational demand was computed for 1980, 2000, and 2020, and tabulated as shown in Table 21. The predicted demands for recreation are shown on Plate 7.

TABLE 21

PROJECTED POPULATION AND DELTA RECREATIONAL DEMAND, 1960-2020
(In thousands)

	:	1960	:	Recreation--	:	1980	:	2000	:	2020	:	
	: Percent:		: Demand	: al use in	:		: Demand	:		: Demand	: Percent	
	: of 1960:	Popula--	: in rec--	: recreation--	:	Popula--	: in rec--	: Popula--	: in rec--	: Popula--	: of	
Residence of	: use	: tion	: reation:	days per	:	tion	: reation:	tion	: reation:	tion	: 2020	
recreationist	: 1/	: 2/	: days	: capita	3/:	: days	: days	:	: days	: days	: demand	
Sacramento Co.	10.7	510	297	.582		1,010	588	1,670	972	2,300	1,339	9.7
San Joaquin Co.	27.2	251	756	3.012		470	1,416	810	2,440	1,220	3,675	26.4
Santa Clara Co.	5.9	653	164	.251		1,285	323	1,870	469	2,425	609	4.4
Alameda Co.	17.4	900	484	.538		1,410	759	2,000	1,076	2,540	1,367	9.8
Peninsula (San Francisco and San Mateo Cos.)	6.5	1,178	181	.153		1,600	245	1,825	279	2,020	309	2.3
Contra Costa Co.	4/10.6	66	295	4.470		161	720	325	1,453	535	2,391	25.3
East of Ambrose												
West of Ambrose	11.2	342	311	.909		614	558	950	864	1,230	1,118	
Solano Co.	4/1.6	4	45	11.250		8	90	49	551	158	1,778	
East of Collinsville												14.4
West of Collinsville	1.2	131	33	.252		302	76	601	151	902	227	
Elsewhere in the State	7.7	11,795	214	5/		21,340	400	31,900	653	42,670	1,065	7.7
TOTALS	100.0	15,830	2,780			28,200	5,175	42,000	8,908	56,000	13,878	100.0

1/ No traffic from out of state was considered.
 2/ Adjusted from preliminary 1960 census of population.
 3/ Recreation-days per capita = 1960 use 1960 population
 4/ These two counties were considered in two sections.
 5/ Separate participation rates utilized for special groups of counties, total projection (only) indicated for 1980, 2000, and 2020.

CHAPTER IV. EFFECTS OF ALTERNATIVE DELTA WATER FACILITIES ON DELTA RECREATION

Construction of the Delta water facilities will affect Delta recreation. The Delta's present recreational use is high and there is every reason to expect this use to increase five times by the year 2020. Consequently, any plans for future water development in the Delta must carefully consider this important facet of the Delta's economy.

In the following pages of this appendix, the effects of the alternative Delta water facilities on recreation will be discussed. Since 66 percent of the Delta recreational use is spent in fishing, the effects of these alternative projects on the Delta fishery will also be discussed. These latter conclusions were made by the State Department of Fish and Game, based on previous studies conducted by that department. In general the effects of the alternative projects on recreation and the fishery will be stated qualitatively. Present studies now underway will assist in final project formulation by defining project effects quantitatively.

Chipps Island Barrier Project

The Chipps Island Barrier Project would not include any physical works in the Delta upstream from the barrier at Chipps Island. As a consequence, boat movement would not be impeded within the Delta. Pleasure craft, as well as craft involved in commercial navigation, would be required to pass through the barrier navigation locks when traveling

between the Delta and Suisun Bay. This could cause a time delay, which would vary depending upon river traffic.

This alternative plan, shown on Plate 11, "Chippis Island Barrier Project," would not offer opportunities for improving vehicular transportation. Consequently, the Delta's lack of road access and the accompanying lack of recreational development would not be easily improved.

When the threat of salinity incursion was removed, at times of high Delta inflows, usually during the winter months, the barrier flood gates would be opened and the Delta's hydraulic regimen would function much as it does now under similar flow conditions. During periods of lower Delta inflow, with the barrier closed and in operation, the Delta would remain, in effect, a fresh-water body. As the season of high local and export water demands progressed, the Delta's water surface elevation would be drawn down about 3 feet. The Delta levees would then have a tendency to dry out in the zone above this lowered water surface. With reoccurring high inflows and the resultant increase in water surface elevation, these levees would again become saturated. This process, repeated many times over, could cause the levees to become cracked and thus weakened. It does not appear likely that levees in such a condition could be allowed to support vegetation, as levee inspection and maintenance would necessarily increase. It is felt that excessive removal of levee vegetation, as might be required in the Delta as a result of this project, would be a detriment to recreation.

The effects of this project, as concluded by the Department of Fish and Game, are as follows:

"This project would be the most damaging of the four studied. It would probably cause a disastrous reduction of almost all species of fish found in the Delta. These losses would be brought about by the rapid salinity and temperature change across the barrier, loss of current in the fresh-water pool for migration direction, striped bass spawning eliminated due to lack of current behind the barrier, loss of important food items, and a threefold increase in pumping of water at Tracy. The amount of Sacramento River water being drawn around the tip of Sherman Island to the pumping plant would be greatly increased. Downstream migrants of the Sacramento River would be diverted to the pumps in large numbers. These fish would have to be screened at the pumps and returned to the river channel below the influence of this current. This condition would be a serious detriment to all fish using the Delta."

Single Purpose Delta Water Project

The Single Purpose Delta Water Project would be constructed and operated as a water supply project, as shown on Plate 12 "Single Purpose Delta Water Project." Four control structures and six channel closures would be located as follows: (1) on Steamboat Slough, below it's confluence with Sutter Slough; (2) on the Sacramento River near Ryde; (3) on the Mokelumne River downstream from it's confluence with Georgiana Slough; and (4) on Holland Cut opposite Holland Tract. Channel closures would be constructed on Miner Slough, Potato Slough, Old River, Middle River, and on both ends of Fishermans Cut.

All control structures and closures, excepting the Fishermans Cut closures, are necessary to help divert incoming fresh water across the eastern portion of the Delta and to prevent this water from degradation due to intruding ocean salinities. The Fishermans Cut closures would permit transportation of higher quality water to that channel and thus provide an agricultural water supply to adjacent Webb Tract and Bradford Island.

Small craft movement in the Delta would be somewhat restricted by these control structures and channel closures. A small craft lock would be included in the Mokelumne River control structure and small craft could pass through the barge lock on the Sacramento River at the Ryde control structure. The Fishermans Cut closures would exclude vessels from that channel. The Holland Cut and Steamboat Slough control structures, and the closures on Old and Middle Rivers and Potato Slough would make it necessary for boaters to follow more circuitous routes. Small craft locks could be included in the Holland Cut and Steamboat Slough control structures if continuing recreation studies or requests from recreationists indicated such a necessity.

There would be no charge to the operators of small craft for using small craft locks. Since locks would be required to offset any recreation detriment caused by the project, the operational costs of these facilities would be a project cost. The size of small craft locks has not yet been finalized, but they would be of sufficient length to accommodate most pleasure boats. Preliminary studies have indicated that a lock length of 60 feet would be sufficient. However, continuing recreation studies will provide more accurate data for developing proper design criteria.

The present clearance beneath the Delta Cross Channel headgates is 6 feet. This lack of sufficient clearance prevents larger pleasure craft from using the cross canal for traveling between the Sacramento and Mokelumne Rivers. Additional intake works and headgates required by the project would be constructed with a clearance of 16 feet. This would remove the present access restriction to the cross canal which affects the majority of boaters.

Under project operation future flows will increase and it will be necessary to enlarge channel capacities by dredging. Dredged spoil material could be placed on small islands or berms, providing approximately 1,900 acres for recreational use.

The Single Purpose Delta Water Project, like the Chipps Island Barrier Project, offers no opportunity for improving the Delta's present lack of road access. Thus many areas suitable for recreational development will continue to remain remote and, consequently, an increasing burden will undoubtedly be placed on recreation areas already becoming overcrowded.

The conclusions by the State Department of Fish and Game, based on their previous studies, are quoted as follows:

"This project would be the least detrimental of the four projects studied. The reversal of flow around Sherman Island would be eliminated. Major fish screens would be installed at the Cross-Delta Canal headworks and at the head of Georgiana Slough. Therefore, downstream migrants in the Sacramento River would be guided down the western side of the Delta out of the influence of the pumps. In general, fish and eggs in the western portion of the Delta would no longer be affected by the pumps. The replacement of the hundreds of existing small irrigation siphons in the western Delta by screened irrigation supply systems would further reduce losses of small fish. In these respects, conditions for fish in the Delta would be improved.

"Fish habitat would not be reduced in the Delta. The one channel that would be isolated under this project would be insignificant. An important effect of the project would be the increased reversal of flow in the San Joaquin River above the Cross-Delta Canal crossing. This reversal of flow would occur during an average of seven months of the year under full project operation. We were unable to evaluate the effect of the reversal. However, it could result in serious losses to salmon that now spawn in San Joaquin River tributaries south of the Mokelumne River. Most seriously affected would be upstream migrating salmon. The amount of water pumped from the Delta would be increased threefold. This increased withdrawal of water would divert proportionately more fish than is presently being diverted."

Typical Alternative Delta Water Project

The Typical Alternative Delta Water Project is a project designed to have alternative features supplementing the basic Single Purpose Delta Water Project. This alternative project is shown on Plate 13, "Typical Alternative Delta Water Project."

Alternative features added to a basic Delta Water Project could provide solutions to many Delta problems, including flood and seepage control, vehicular transportation, and recreation. Reference to Plate 13 indicates that the physical features of this project differ from the Single Purpose Delta Water Project in only one major aspect. This difference is a master levee system which protects the Delta islands north of the San Joaquin River from flooding and channel seepage.

This master levee would join with the present Sacramento River Flood Control Project levees to encircle the group of islands bounded by the Sacramento River, Threemile Slough, the San Joaquin River, and the South Fork of the Mokelumne River. In a similar manner the islands east of the South Fork of the Mokelumne River and north of the San Joaquin River would be enclosed by a master levee. These levees would protect the enclosed lands from flooding by excluding flood and tidal waters from the isolated interior channels. Channel seepage to these lands could be reduced by lowering the water surface in the isolated channels 5 feet.

The same control structure and channel closures required for the Single Purpose Delta Water Project would be required for the Typical Alternative Delta Water Project. These features would be located as previously described, with one exception. The control structure on the

Mokelumne River would be eliminated and the small craft lock would be moved downstream, from its location as noted for the single purpose plan, to the junction of the Mokelumne and San Joaquin Rivers. At this location it would be incorporated into the master levee.

Additional facilities for navigation access to the isolated channels would be provided by a small craft lock connecting the San Joaquin River and Fourteenmile Slough and by five small craft portage facilities. The small craft locks would be as described in the preceding discussion of the single purpose plan. The small craft portage facilities shown on Plate 13 would accommodate boats up to 25 feet in length, be self-operating, and be provided without charge to the user. Present studies underway will determine the number of these facilities that should be provided at each location. As future recreational use increases, these facilities could be expanded as the need dictated.

Because of the master levees, this plan would restrict recreational navigation to a greater degree than either the Chipps Island Barrier Project or the Single Purpose Delta Water Project. However the effects created by the master levee could, with proper planning and development, offer opportunities for enhancing recreation far beyond any detriments caused by such restrictions.

The master levee system would isolate 143 miles of levees and 3,700 acres of water from tides and flood water. The need for extensive removal of vegetation from these interior levees would then no longer be required. The nontidal waters of the interior channels would be more conducive to marina development and the absence of flood waters would permit construction and retention of beaches. Problems associated with

needed waterway zoning and conflicting recreational use could be minimized due to the separation and isolation of these channels. Water of high quality would be assured in the isolated channels since fresh releases into these channels would be made for agricultural purposes.

It would be desirable, as a part of this plan, to acquire public use rights to these interior channels, thus assuring proper recreational development.

As with the Single Purpose Delta Water Project, this plan would also provide 1,900 acres of land for recreation from dredged spoils. An additional 1,900 acres of public waterfront land would be made available along the master levees.

This plan, because of the master levees, would provide excellent opportunities for developing vehicular access. The master levee would have a service road on the crown with a width of 14 feet. On the landward side would be a roadway, 32 feet in width, with parking facilities or turnouts to the levee crown, wherever needed.

Quoted below are conclusions developed by the State Department of Fish and Game from past studies of this project's effects on the Delta fishery.

"This project would be the second least detrimental. Losses would be expected to be greater than the Single Purpose Project because of the reduction of 8 percent of the fish habitat through channel closures, and partial channelization of the Cross-Delta Canal. The channelization would cause a detriment by channeling the fish toward the pumps by a more direct route. Water diversions into isolated channels would be screened and loss of fish would be reduced. However, loss of eggs and fry would be unavoidable. Other project conditions would be the same as the Single Purpose Project."

Comprehensive Delta Water Project

This plan, shown on Plate 14, "Comprehensive Delta Water Project," would incorporate all the facilities included within the Typical Alternative Delta Water Project. In addition, a master levee system would be provided to Delta islands south of the San Joaquin River. One additional control structure would be required on the San Joaquin River at its junction with Paradise Cut and three additional small craft locks would be provided, along with twelve additional small craft portage facilities. These additional works are shown on Plate 14.

Fifty-nine hundred acres of public use lands could be made available from dredge spoils and master levee waterfront lands.

The effects of these added features would be similar, with respect to recreation benefits and detriments, to those outlined for the Typical Alternative Delta Water Project. However, flood and seepage control and any recreational benefits derived from master levees south of the San Joaquin River might be offset by an excessive number of channel closures.

The Department of Fish and Game conclusions were:

"This project would be the third least detrimental. It would cause greater loss than the Typical Alternative Project because of the reduction of 14 percent of the fish habitat, and the complete channelization of the Cross-Delta Canal. This would channel the fish directly to the pumps. Other project conditions would be the same as in the Single Purpose Project."

Summary of Project Effects on Recreation

Each of the four projects discussed in this report would affect the recreational use of the Delta to some degree. The

construction of channel closures would, to varying degrees, be detrimental to the Delta fishery and to recreational boating. On the other hand the channel closures included in the Typical Alternative and Comprehensive Delta Water Projects would offer opportunities for increased recreational development. Additional public lands suitable for recreational development would be made available from construction of the Single Purpose, the Typical Alternative, or the Comprehensive Delta Water Project.

The Chipps Island Barrier Project would have two major effects on Delta recreation: (1) the barrier would be detrimental to the Delta fishery; and (2) small craft traveling between the Delta and Suisun Bay would be delayed at the barrier locks.

The Single Purpose Delta Water Project would be the least detrimental to the Delta fishery. The project's six channel closures and four control structures would restrict small craft movements. Through construction of the project, 1,900 acres of land would be made available for recreational development.

The Typical Alternative Delta Water Project could reduce the population of anadromous fish. Small craft movements would be restricted by the master levee system and three control structures. Five small craft portage facilities and two small craft locks would be constructed to provide access to the interior channels. Vehicular transportation would be improved and this project would provide 3,800 acres of waterfront lands for recreational development.

The Comprehensive Delta Water Project could also reduce the population of anadromous fish. Small craft movements would be restricted

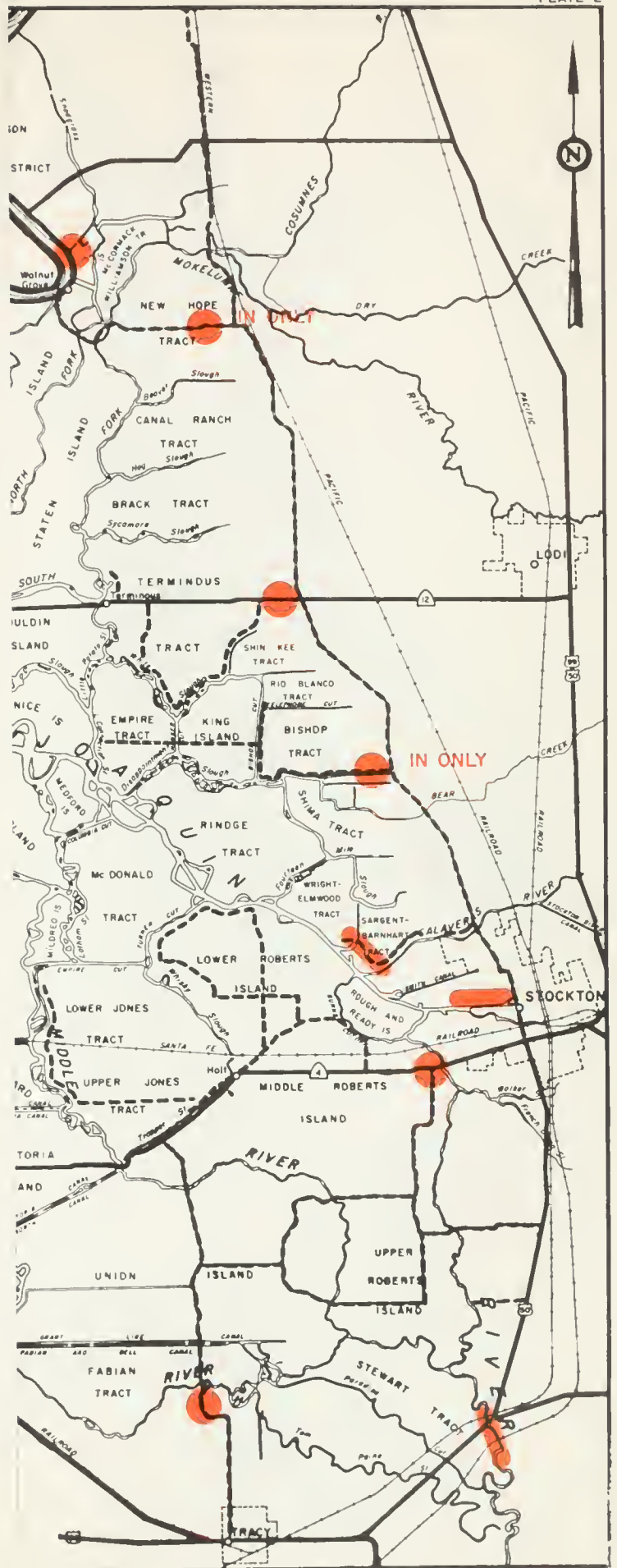
by master levees north and south of the San Joaquin River and by four control structures. Access to the interior channels would be provided by 17 small craft portage facilities and 4 small craft locks. Further improvement in vehicular access would be provided by constructing master levees south of the San Joaquin River. The project would also make available 5,900 acres of waterfront land for recreational development.

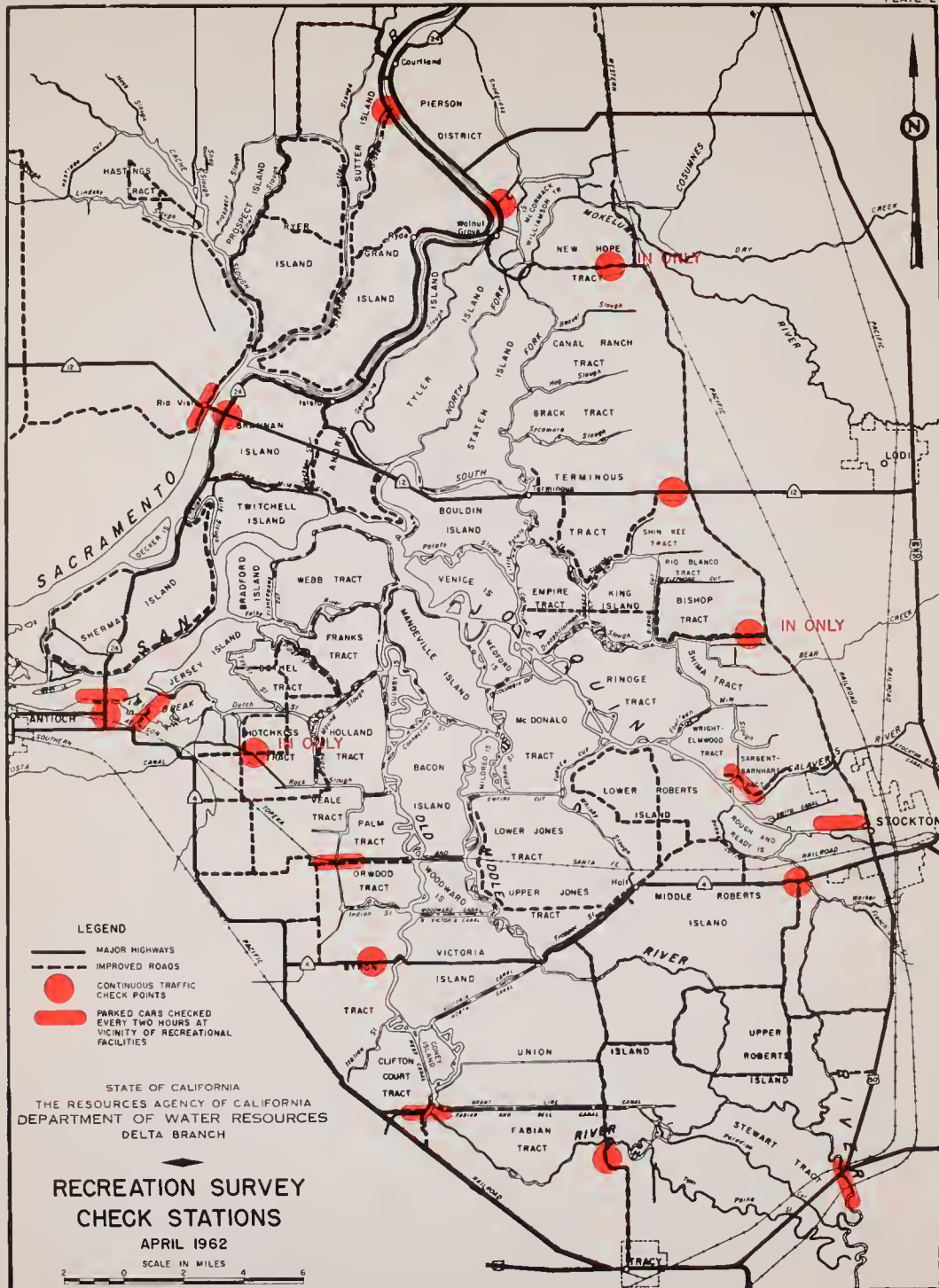
The physical features of all four projects, as they relate to recreation, are summarized in Table 22.

Table 22

SUMMARY OF PROJECT EFFECTS ON RECREATION

Item	:Chipps : :Island : :Barrier: :Project:	Single : Purpose : Delta Water: Project	Typical : :Alternative : Delta Water: Project	Compre- hensive : Delta Water: Project
Control structures	1	4	3	4
Channel closures	1	10	23	41
New master levees (miles)	0	0	90	185
Fishways	1	1	1	1
Principal fish screens	0	2	1	1
Barge locks	1	1	1	1
Small craft locks	0	1	2	5
Small craft portage facilities	0	0	5	17
Open navigable area (acres)	49,500	49,400	45,800	42,600
Navigable interior area (acres)	0	100	3,700	6,900
Open navigable channels (miles)	700	695	590	450
Navigable interior channels (miles)	0	5	110	250
Project roads (miles)				
Paved	0	0	33	70
Graveled	0	1	47	109
State and county levee roads (miles)	295	295	279	265
New inter-island accesses (closures)	0	6	22	39
New public waterfront land (acres)				
From master levees	0	0	1,900	3,600
From dredge spoils	0	1,900	1,900	2,300
Normal overhead clearance through Delta Cross Channel (feet)	6	16	16	16





EDMUND S. SHOWN
REVENUE
HARVEY D. BAKER
DURATION



ADDRESS ONLY TO
P. O. BOX 138 SACRAMENTO 2
1126 N STREET MAY 20 1961

STATE OF CALIFORNIA
Department of Water Resources
SACRAMENTO

July 25, 1961

Dear Recreationist:

We are presently conducting detailed studies in the Delta which involve plans for recreation development. These studies are being conducted to determine the most beneficial plan to conserve water, provide flood and seepage control, salinity control, and improve highway facilities, as well as recreation development. In conjunction with the recreation studies, we made a traffic survey at key locations on highways in the Delta on Memorial Day. From this survey we determined that a vehicle registered in your name was used for a recreation trip in the Delta. Therefore, we are contacting you for assistance in gathering information essential to our studies.

Our studies involve plans for facilities necessary to minimize any adverse effects on recreation which might result from works needed for water conservation, flood and seepage control, at cetera, and also facilities needed to enhance the recreational potential of the Delta. We are also considering plans developed by counties and other local agencies interested in recreation.

In order that we can prepare a coordinated master plan for long-range development of recreation in the Delta, we would greatly appreciate your assistance in completing the enclosed questionnaire. Your cooperation and prompt return of this questionnaire and suggestions will provide us with important information. If you would like an extra copy of the enclosed map which we wish to have returned, please let us know and we will provide copies to you.

We hope you enjoyed your outing on Memorial Day, and that with your assistance we will be able to preserve and improve the recreation facilities in the Delta.

Sincerely yours,

WILLIAM L. BERRY, Chief Engineer
Division of Resource Planning

By *Herbert W. Greysano*
Herbert W. Greysano
Supervising Hydraulic Engineer

Encl.

QUESTIONNAIRE
SACRAMENTO-SAN JOAQUIN DELTA RECREATION STUDY

What city or town do you live in? _____

How many people are usually included in your Delta recreation trips? _____

If you use a boat, do you usually:

Tow or haul it to the Delta _____
Keep it berthed in the Delta _____
Rent one in the Delta _____

As nearly as possible, estimate the number of days during the year that you spend in the Delta in each activity.

Spring Summer Fall Winter
(Mar-May) (Jun-Aug) (Sept-Nov) (Dec-Feb)

Boat fishing (primarily) _____
Cruising (primarily) _____
Water skiing (primarily) _____
Fishing from the bank _____

How many times a year do you stay overnight in the Delta in a:

Camping area _____
Trailer house _____
Boat _____
Rented cabin or motel _____
Private cabin or home _____

How many times a year do you go principally to swim? _____
Where? _____

If more areas were developed, what type of facilities do you think would be most useful?

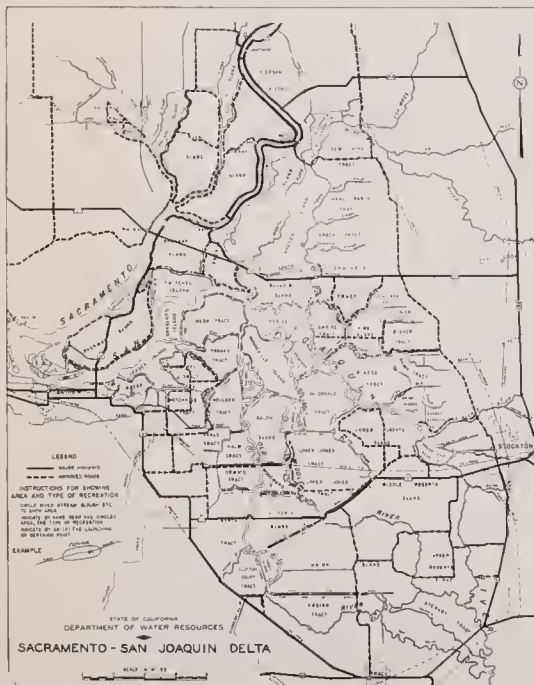
Campsites _____ Berths _____
Daytime picnic areas _____ Launching ramps _____
Access roads _____ Beaches _____
Parking areas _____

What other fishing and boating areas outside the Delta do you frequently visit?

1. _____ 2. _____

Please indicate on the enclosed map the areas in the Delta which you use (see directions on the map).

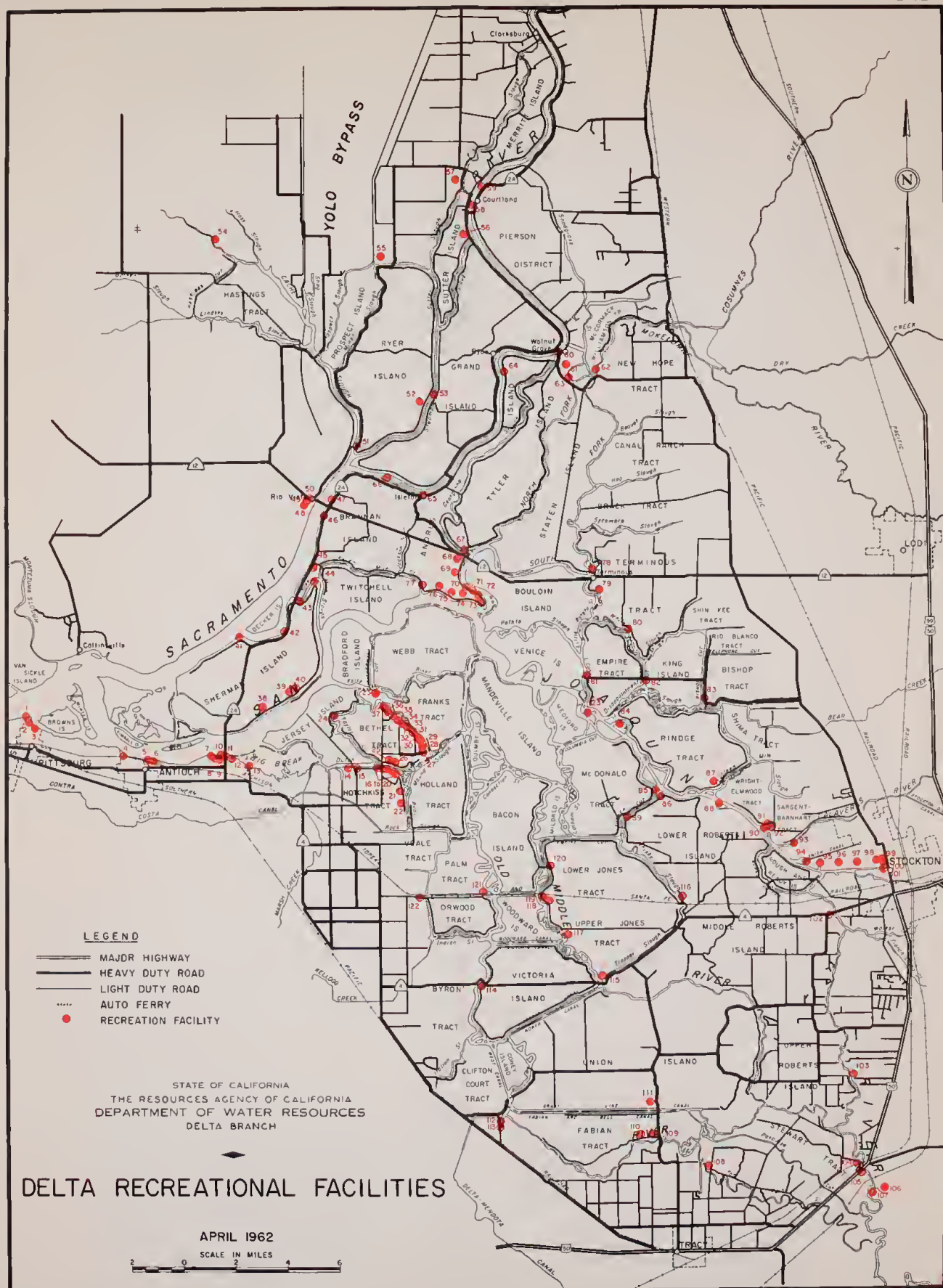
REMARKS: On the back of the map please describe areas that you believe should be developed or left undeveloped, areas you have noticed becoming crowded, facilities needed, regulations needed, new things you've noticed in Delta recreation, or anything that you think will be of benefit to recreation users of the Delta.

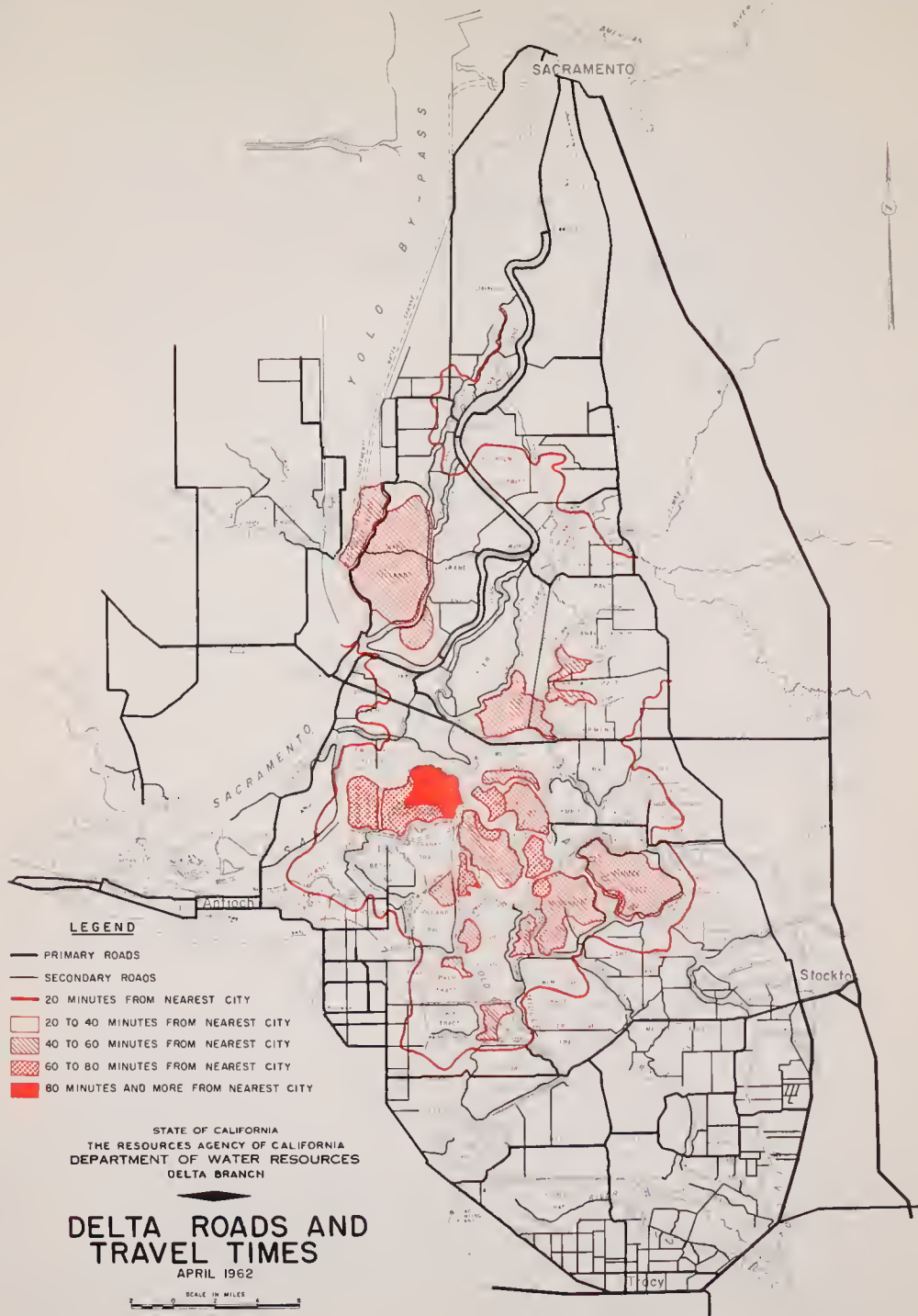


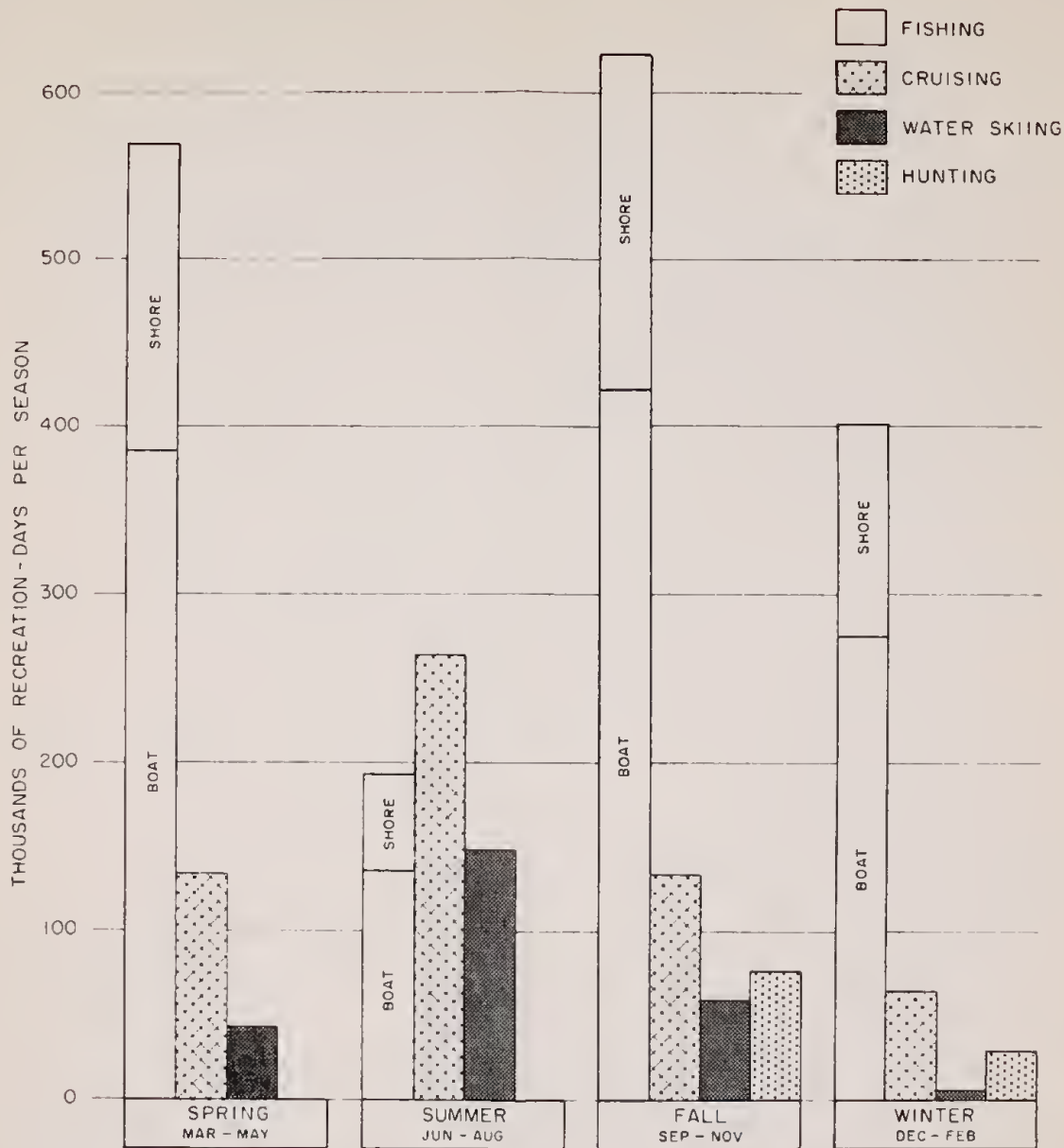
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DELTA BRANCH

RECREATION SURVEY
QUESTIONNAIRE

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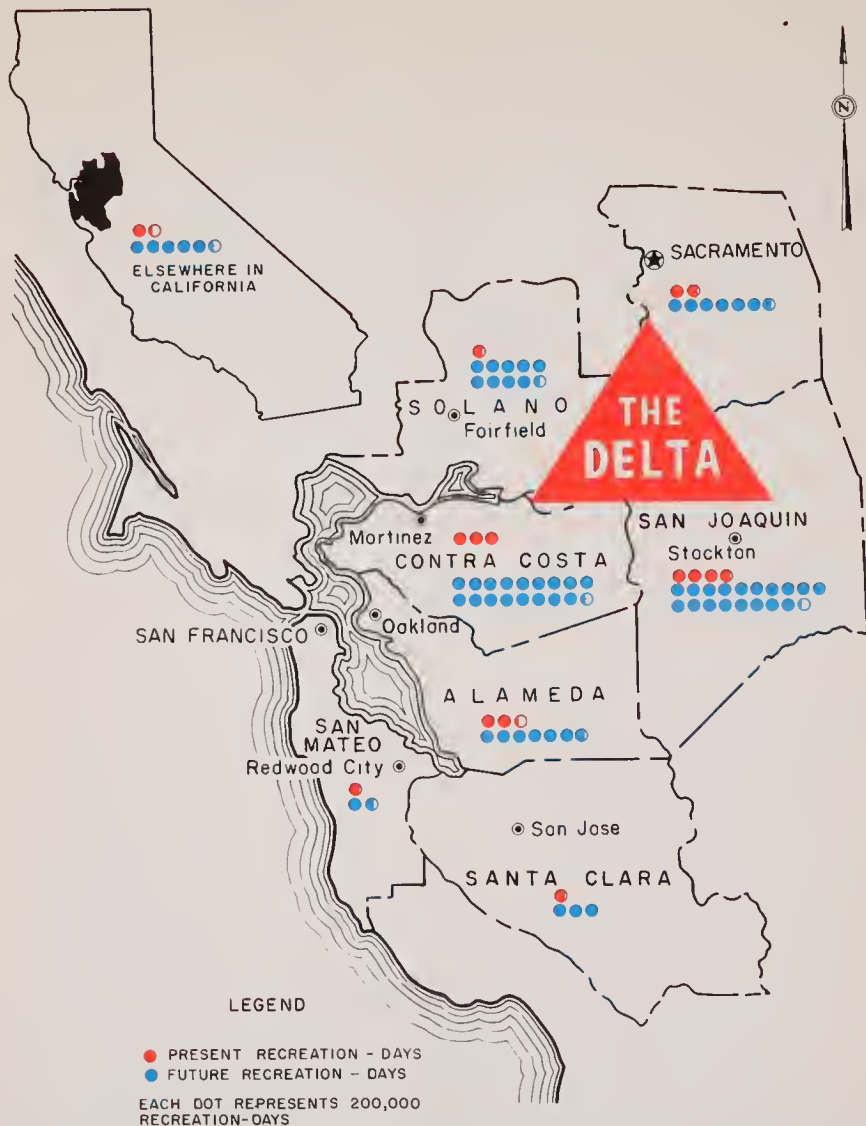




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 DELTA BRANCH

SEASONAL DISTRIBUTION OF
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 IN THE DELTA AREA

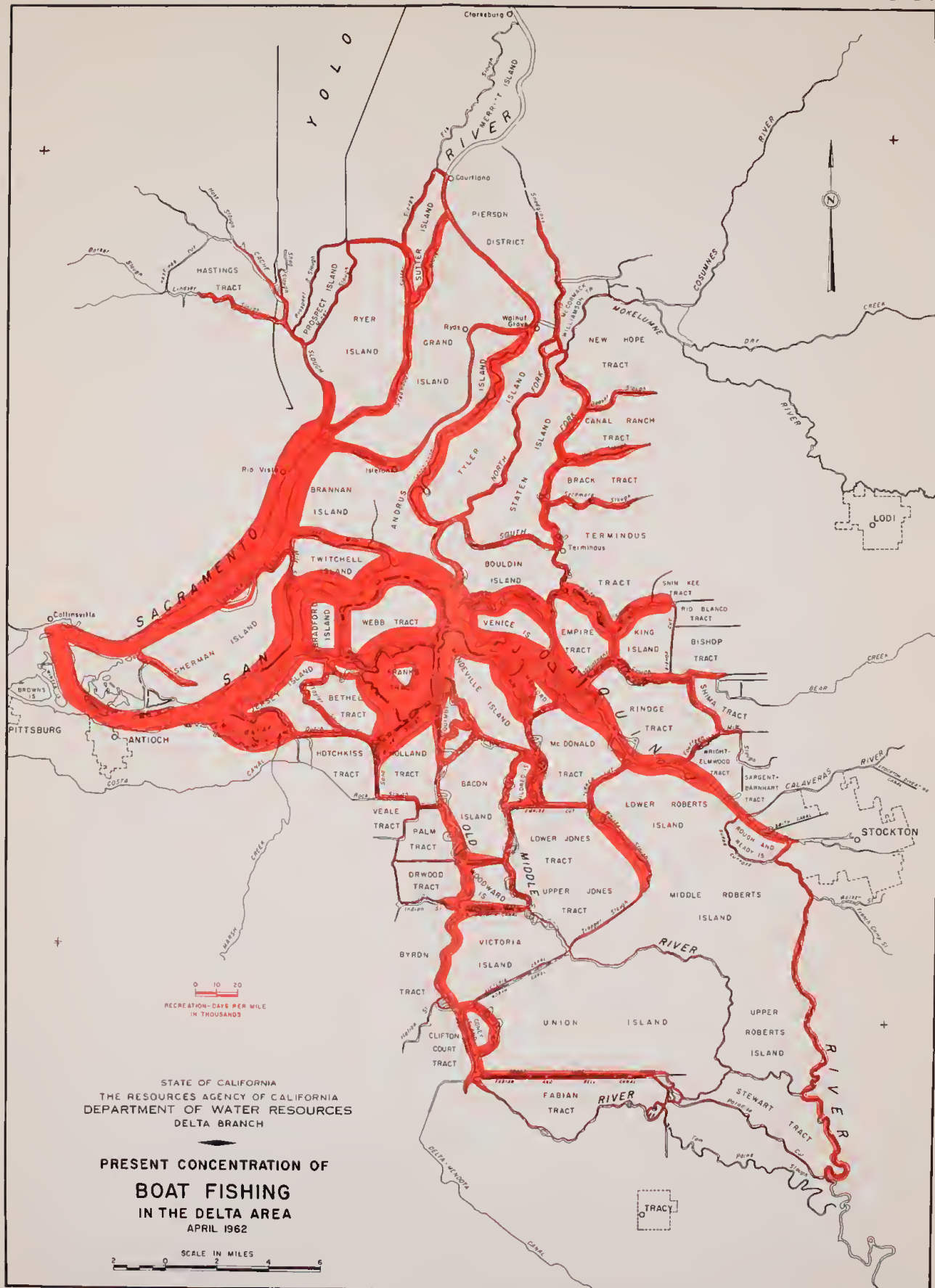
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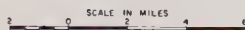


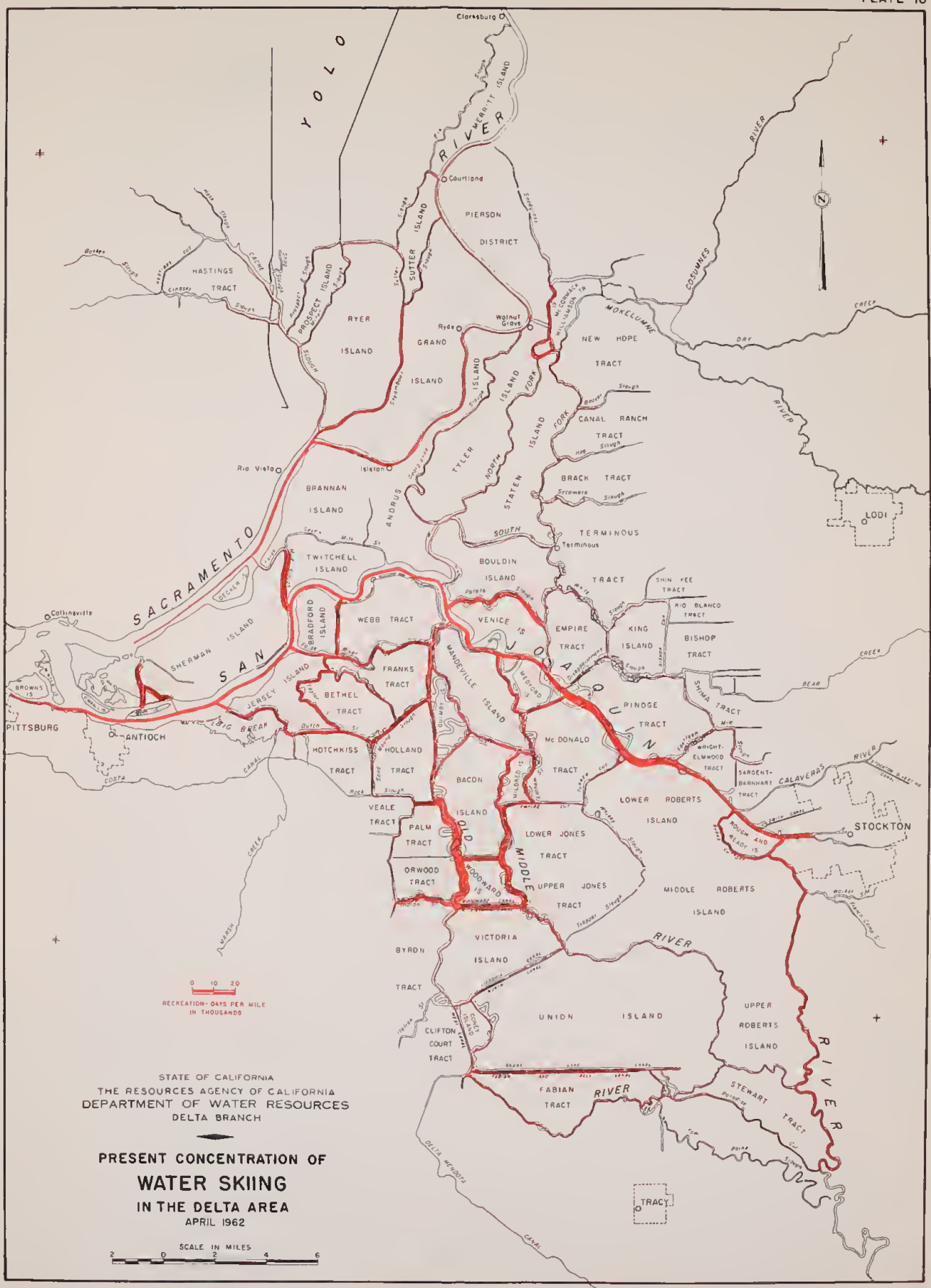
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AREAS OF ORIGIN DELTA RECREATIONISTS

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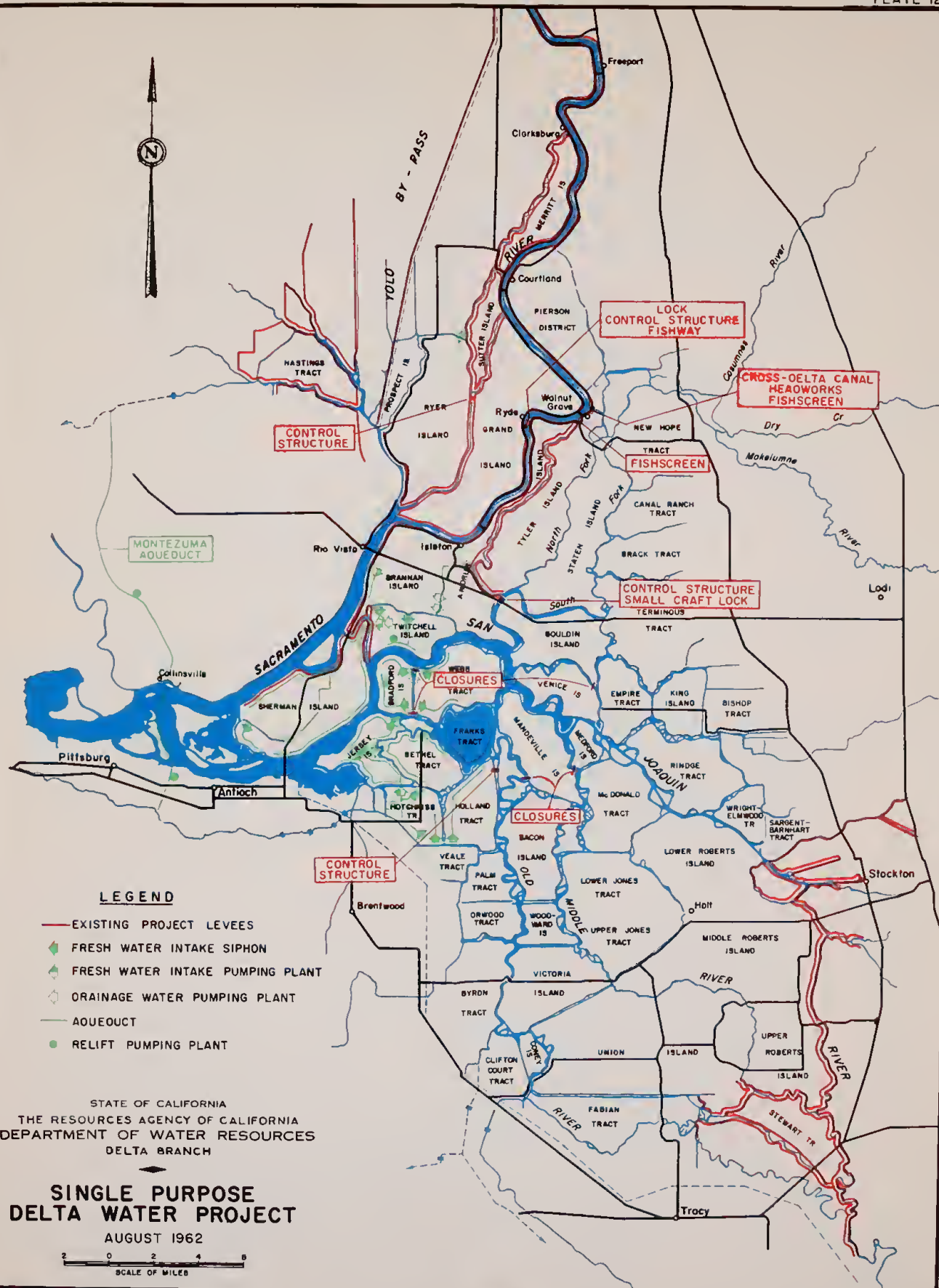


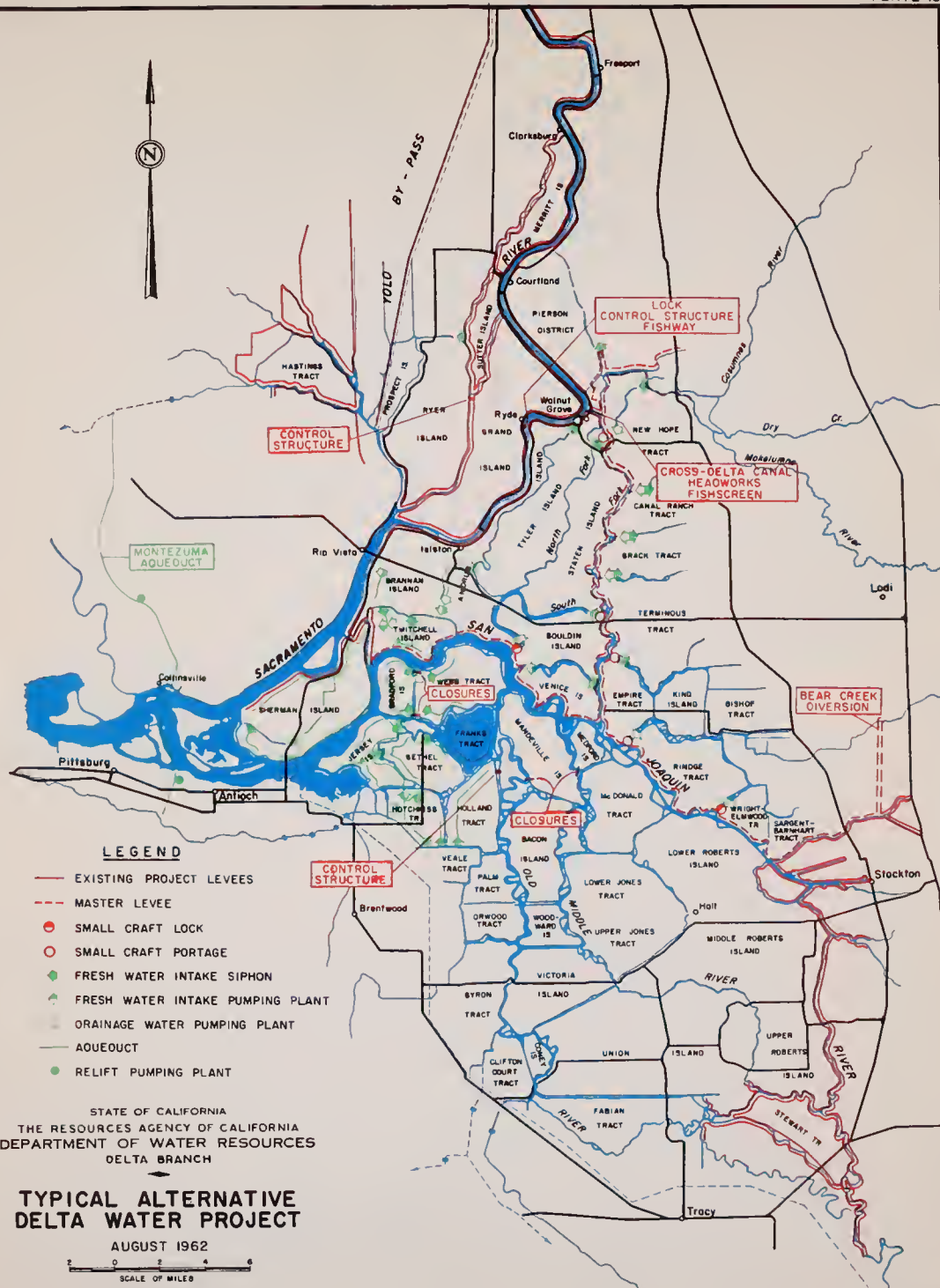
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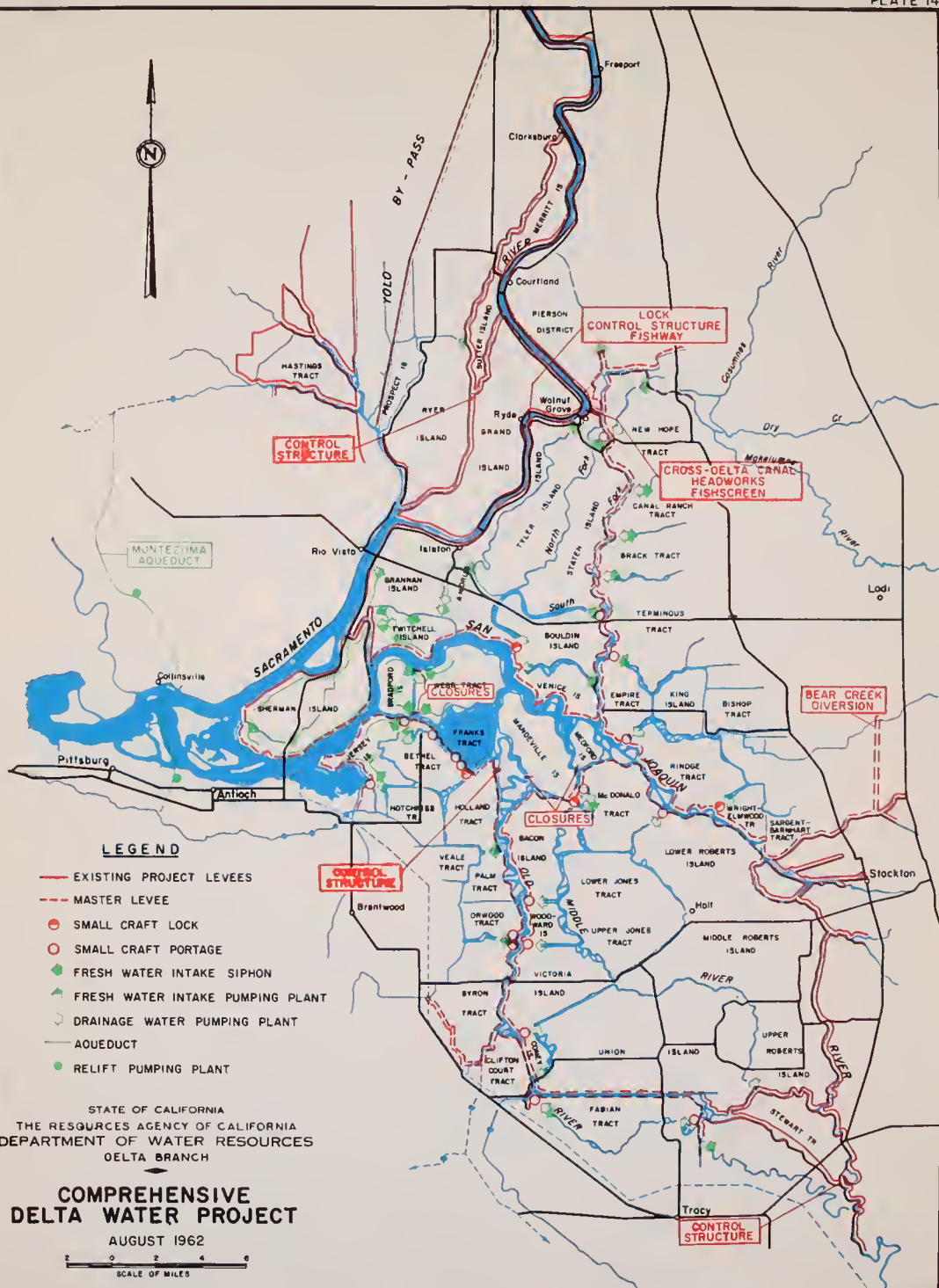
**PRESENT CONCENTRATION OF
WATER SKIING
IN THE DELTA AREA
APRIL 1962**

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